US 6,060,660 A

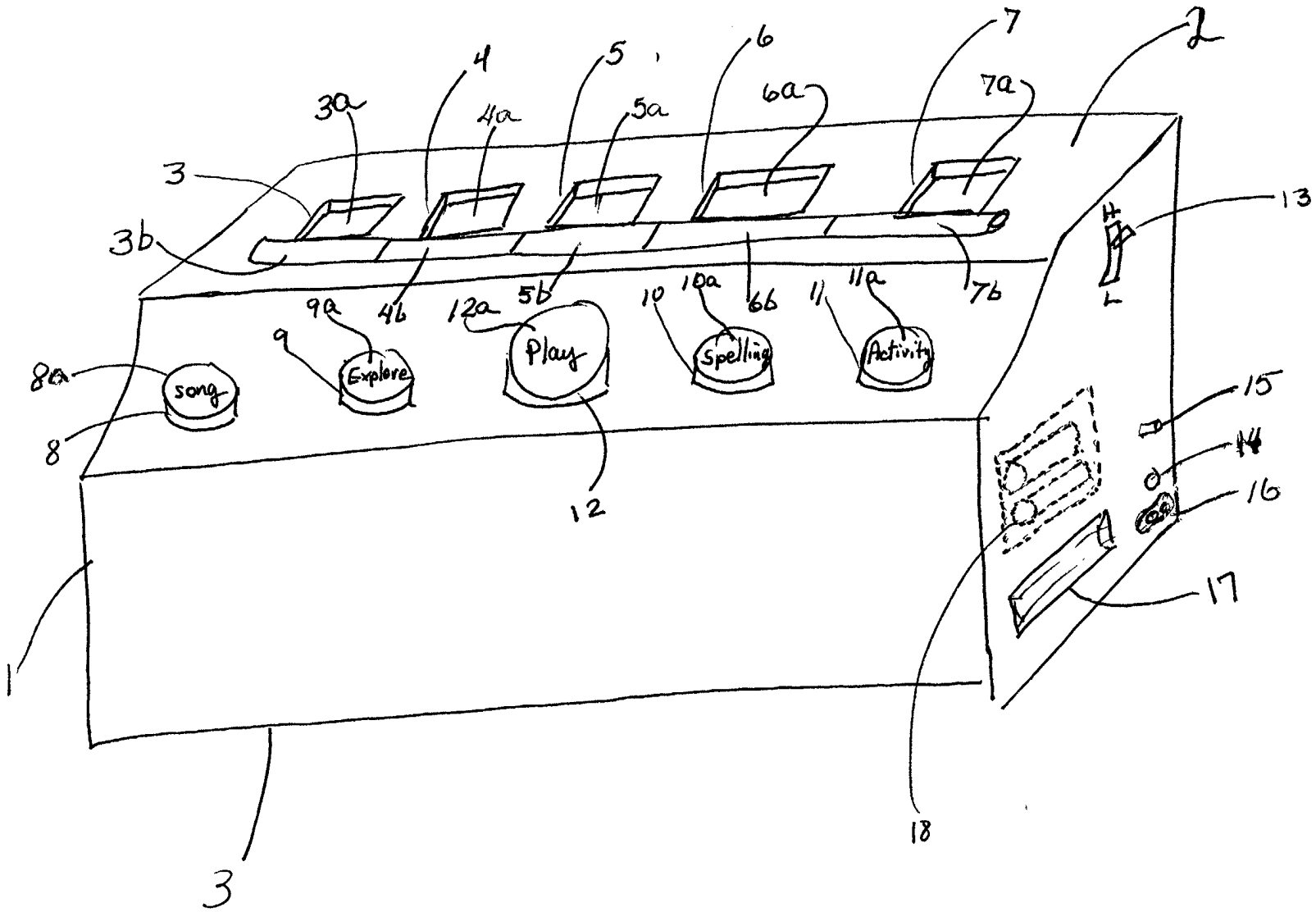


FIG. 1

EUROPEAN PATENT OFFICE

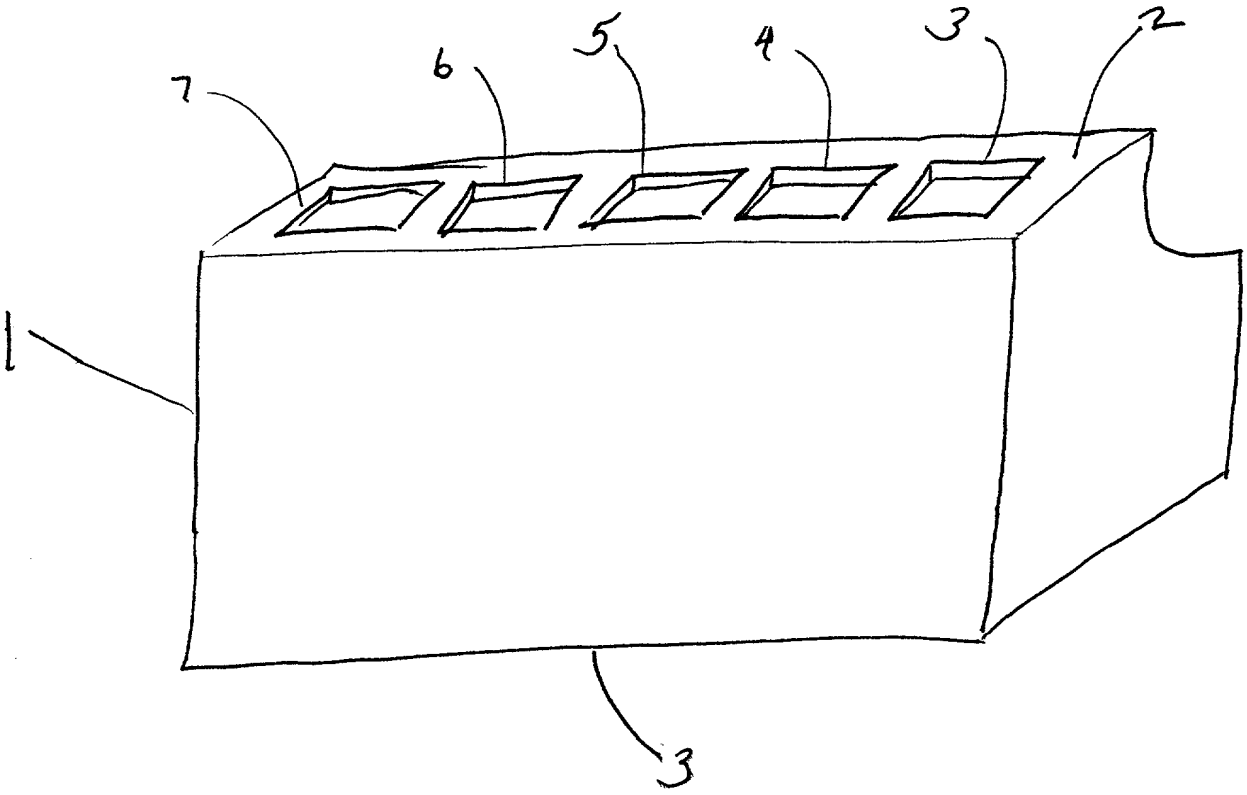


FIG. 2

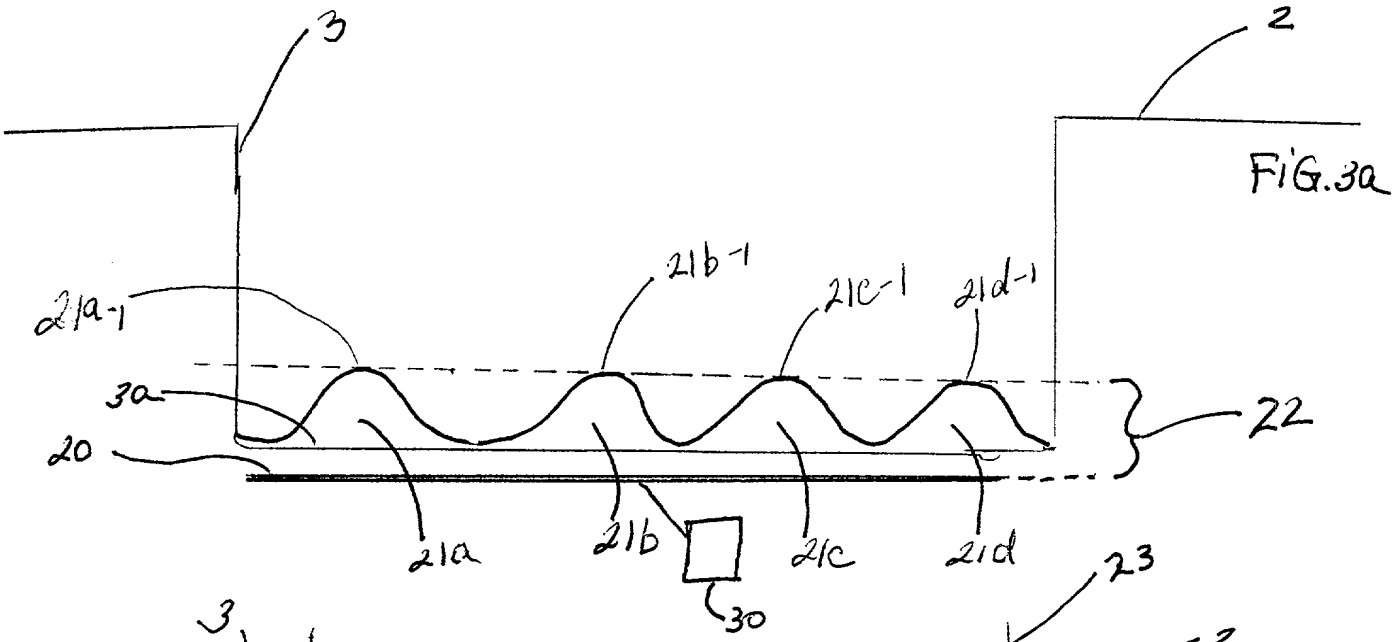


FIG. 3a

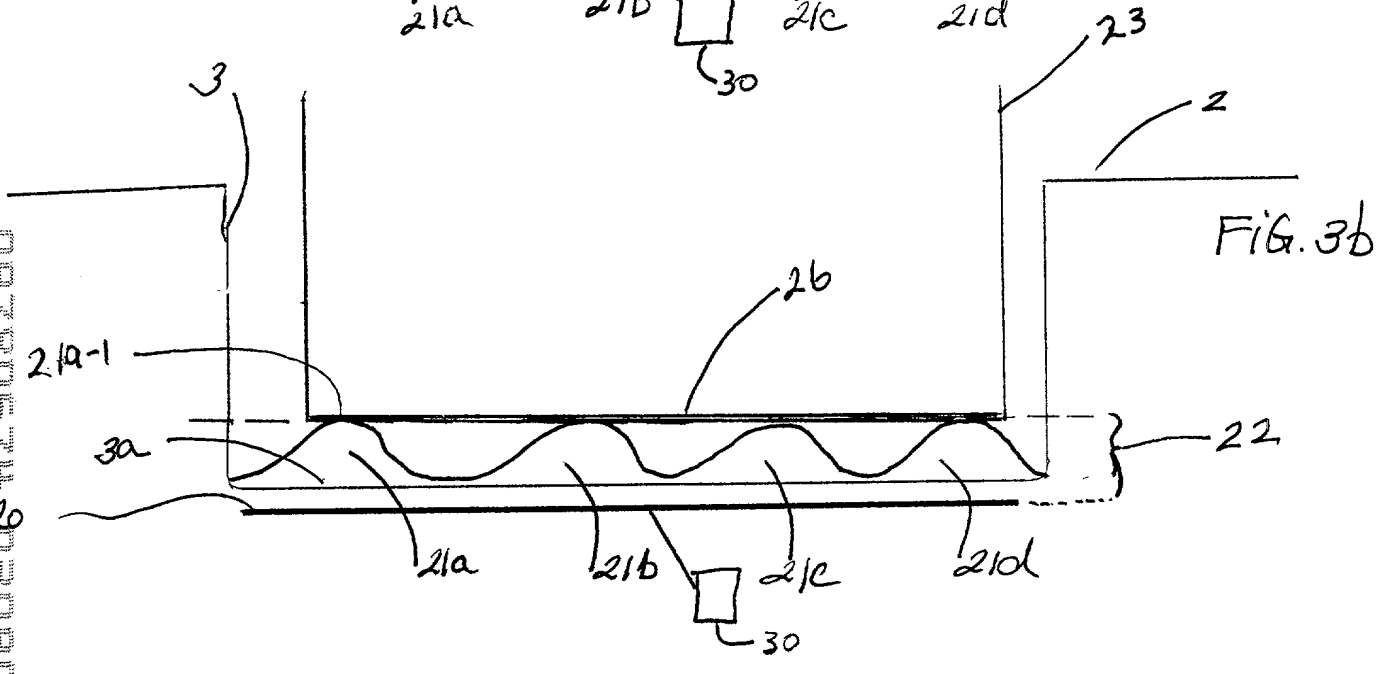


FIG. 3b

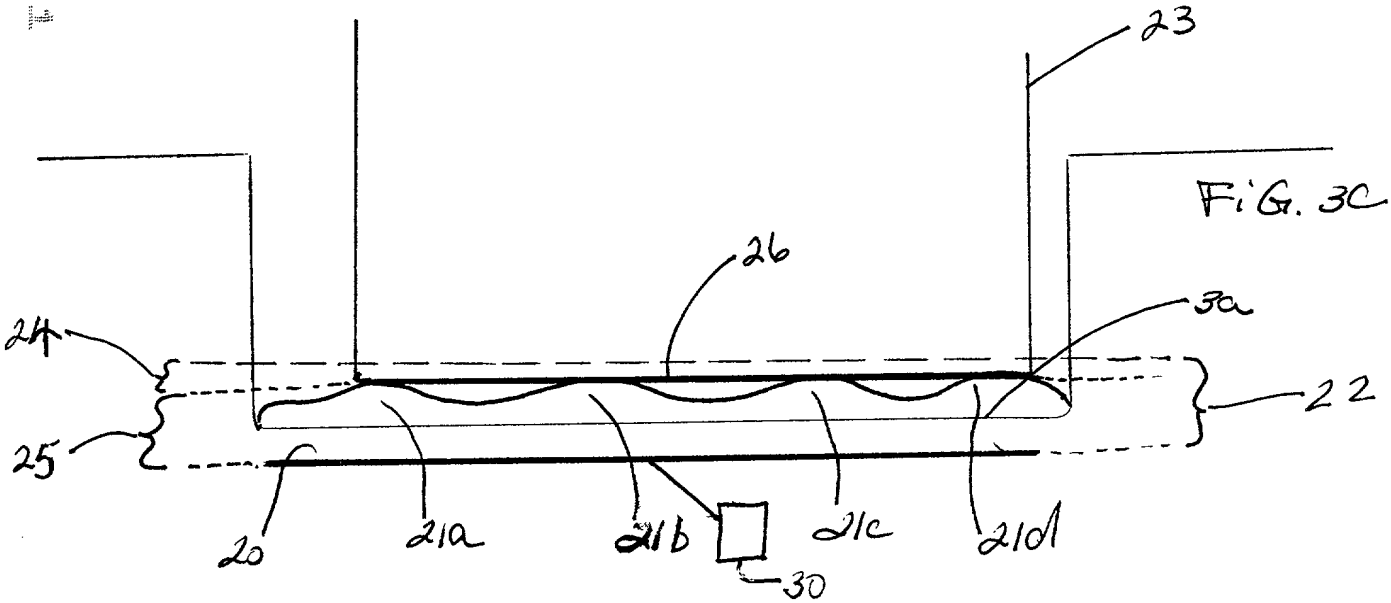


FIG. 3c

TD6020 "tc9082601

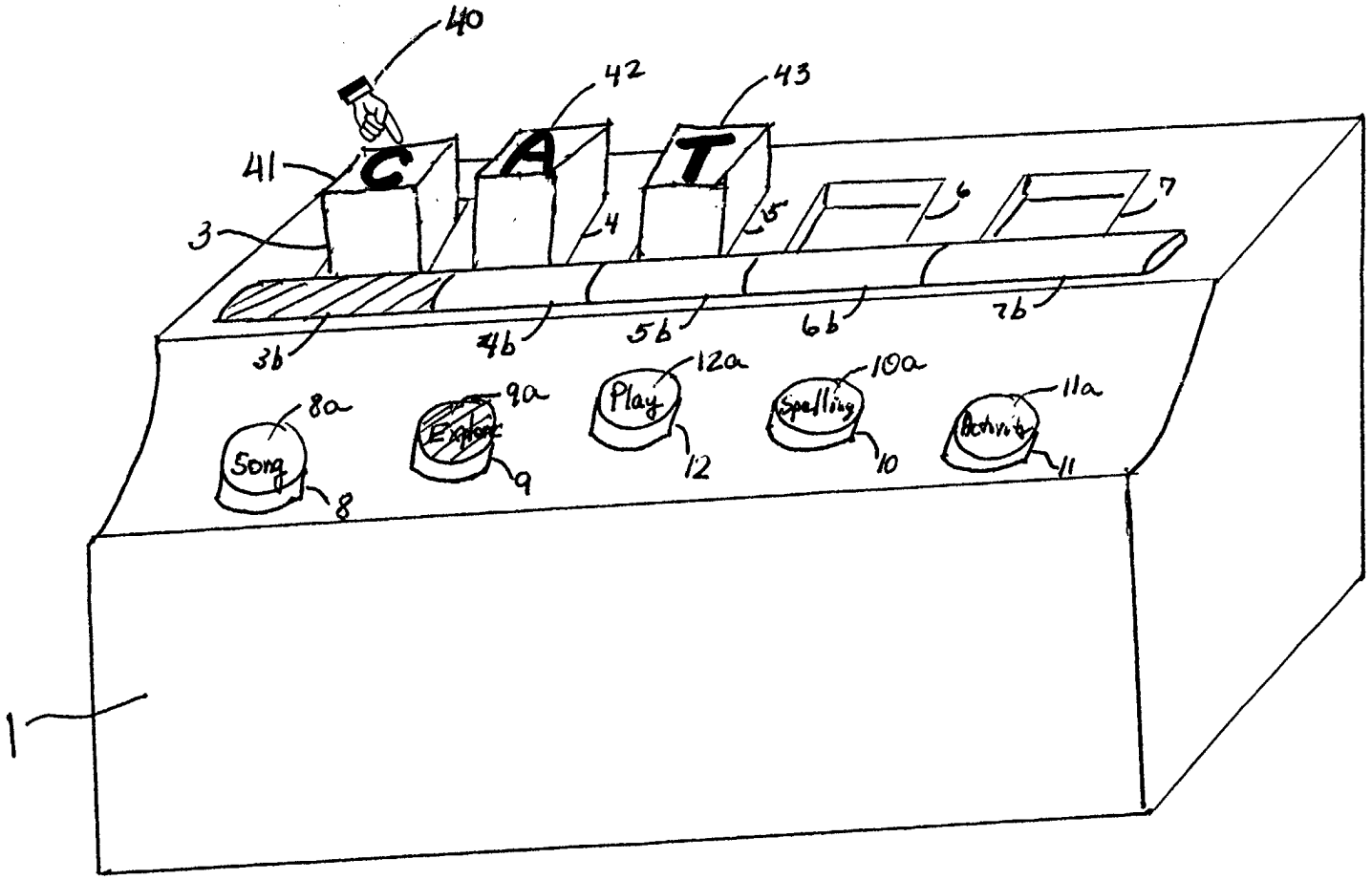


FiG. 4a

TO6020 "A2908260

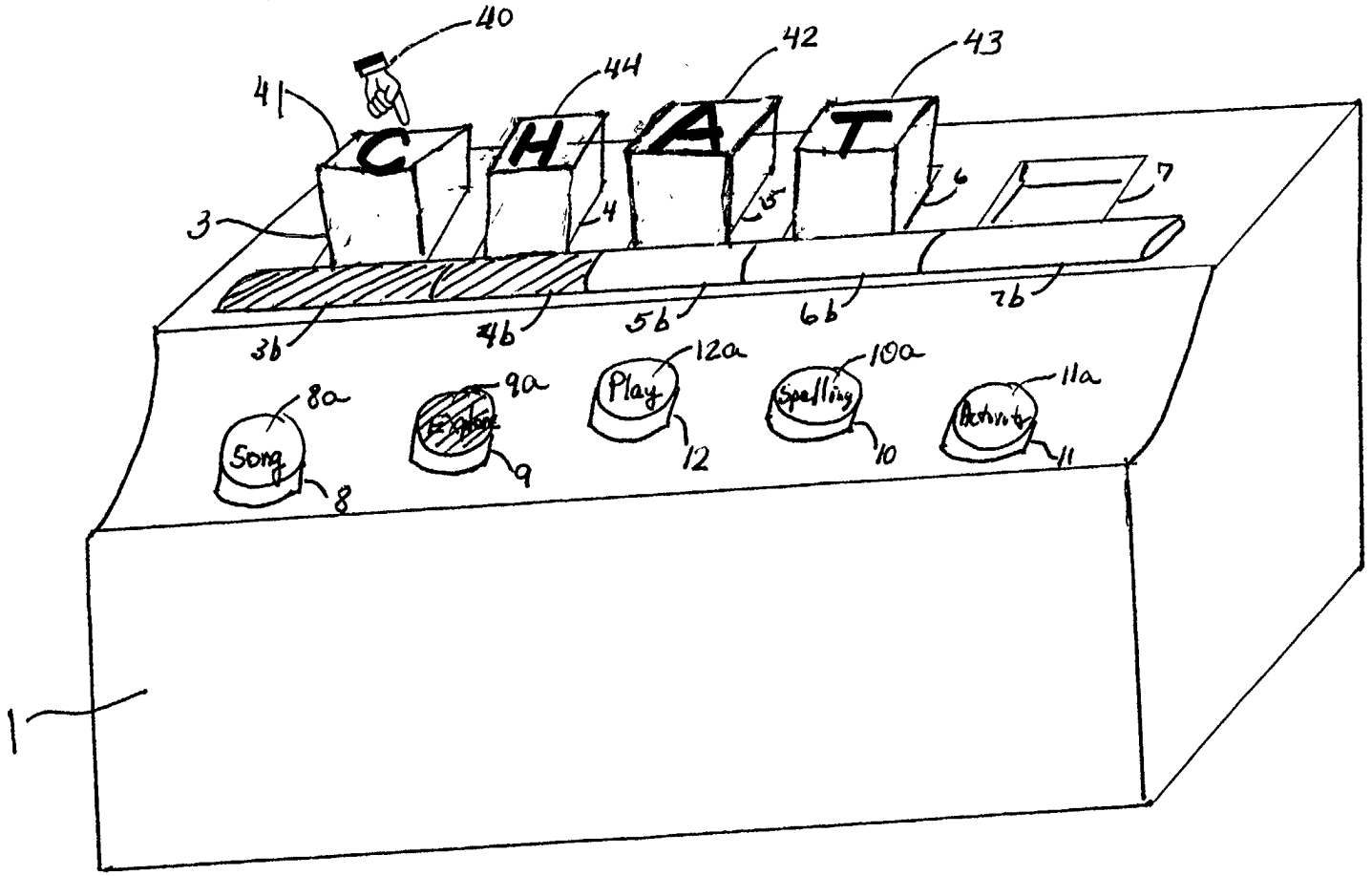


FIG. 4b

EP 0 660 290 A2

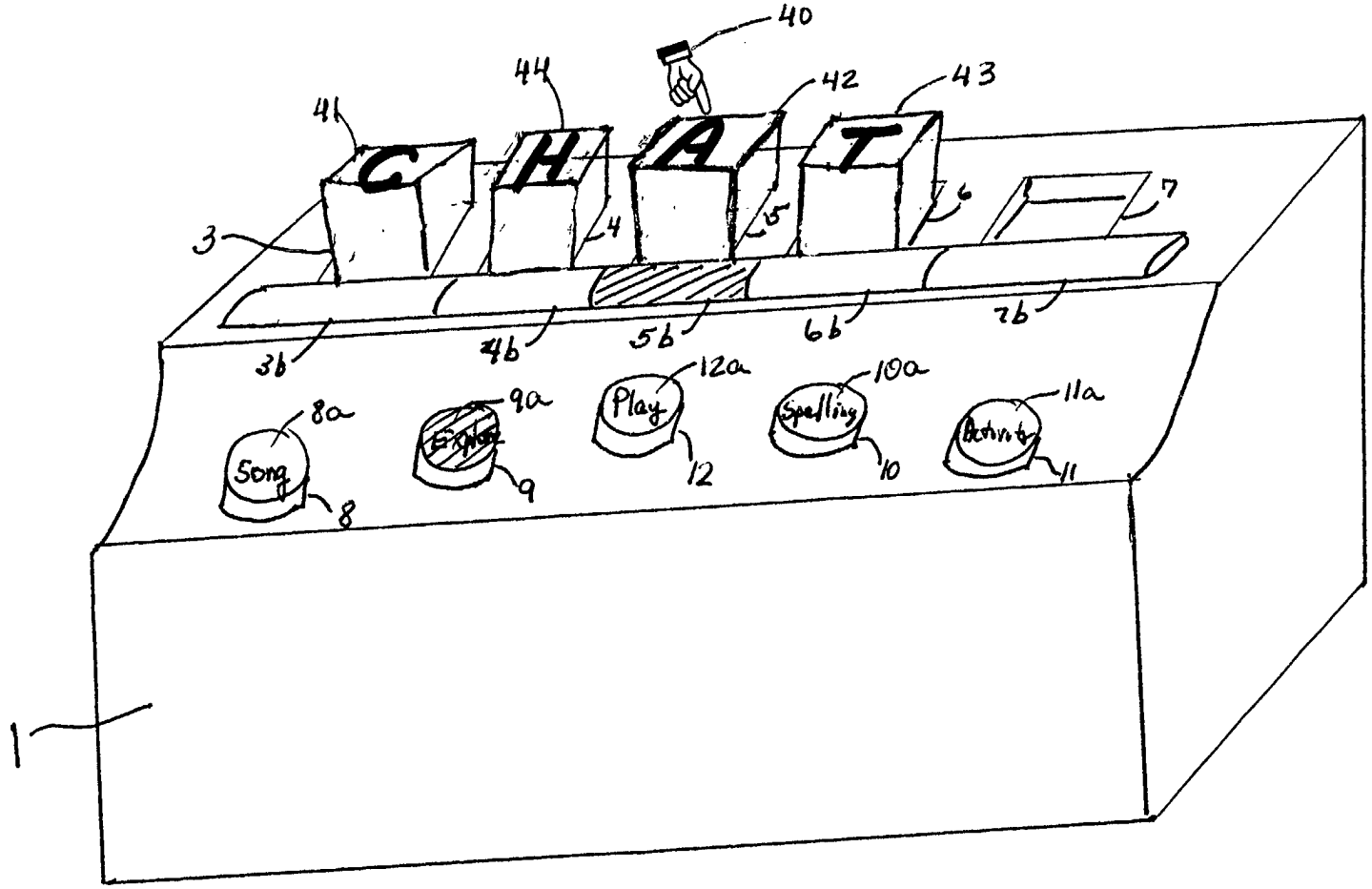


FIG. 4C

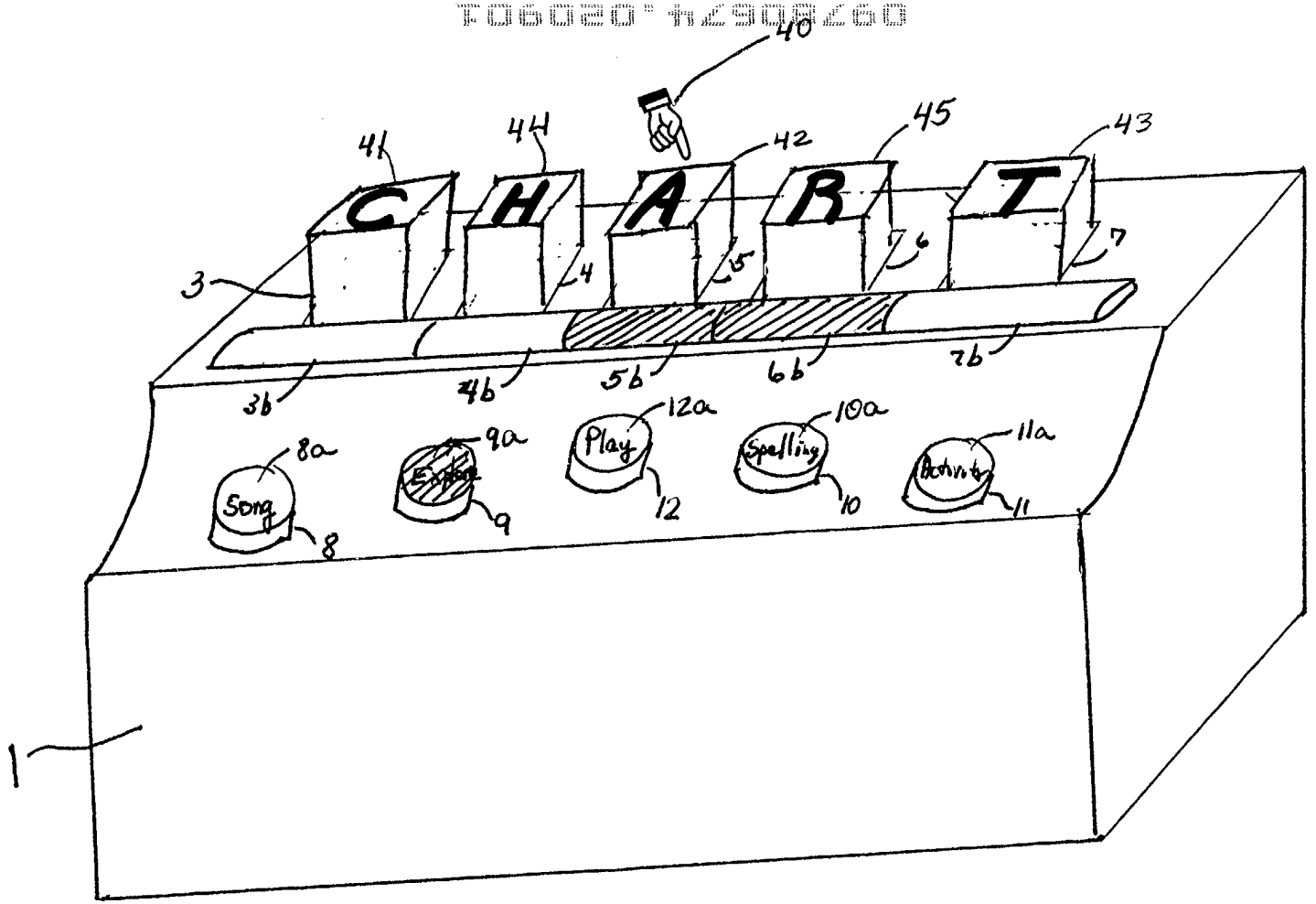

40
41
44
42
45
43
C
H
A
B
T
3
4
5
6
7
3b
4b
5b
6b
7b
8a
9a
12a
10a
11a
Song
Play
Spelling
8
9
12
10
11
1

FIG. 4d

EP 0 660 290 A2

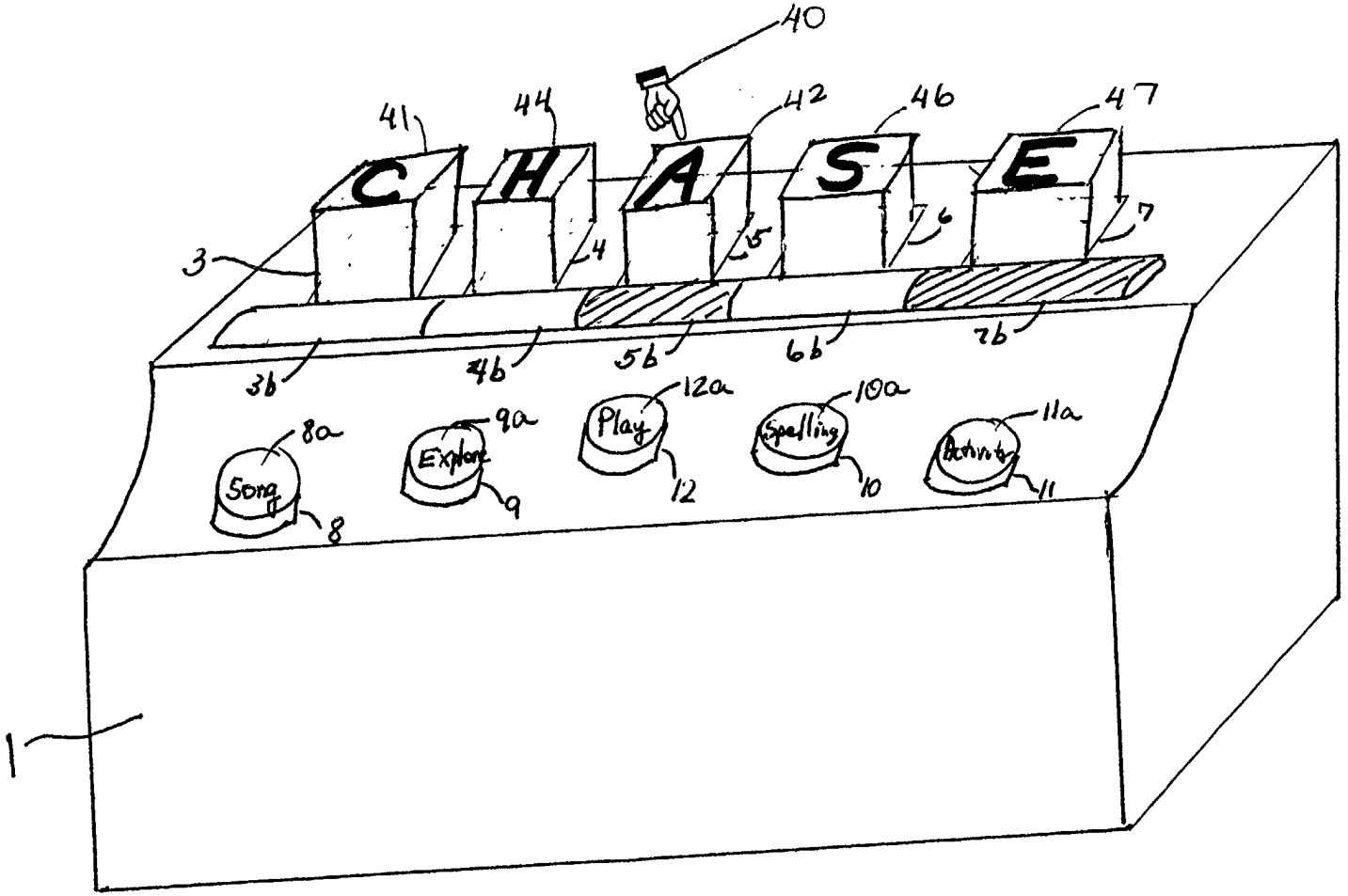


FIG. 4e

EP 0 660 290 A2

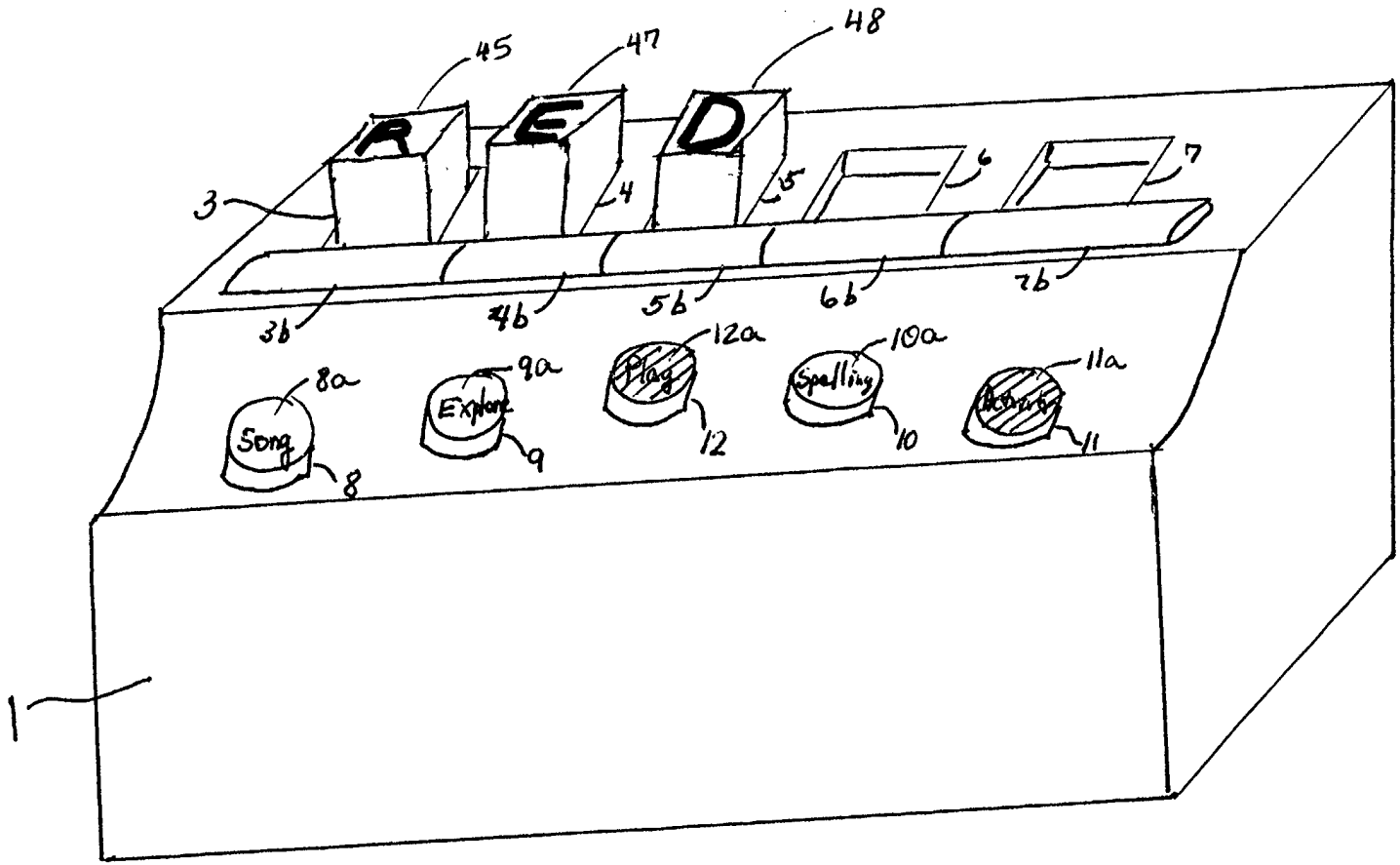


FIG. 5

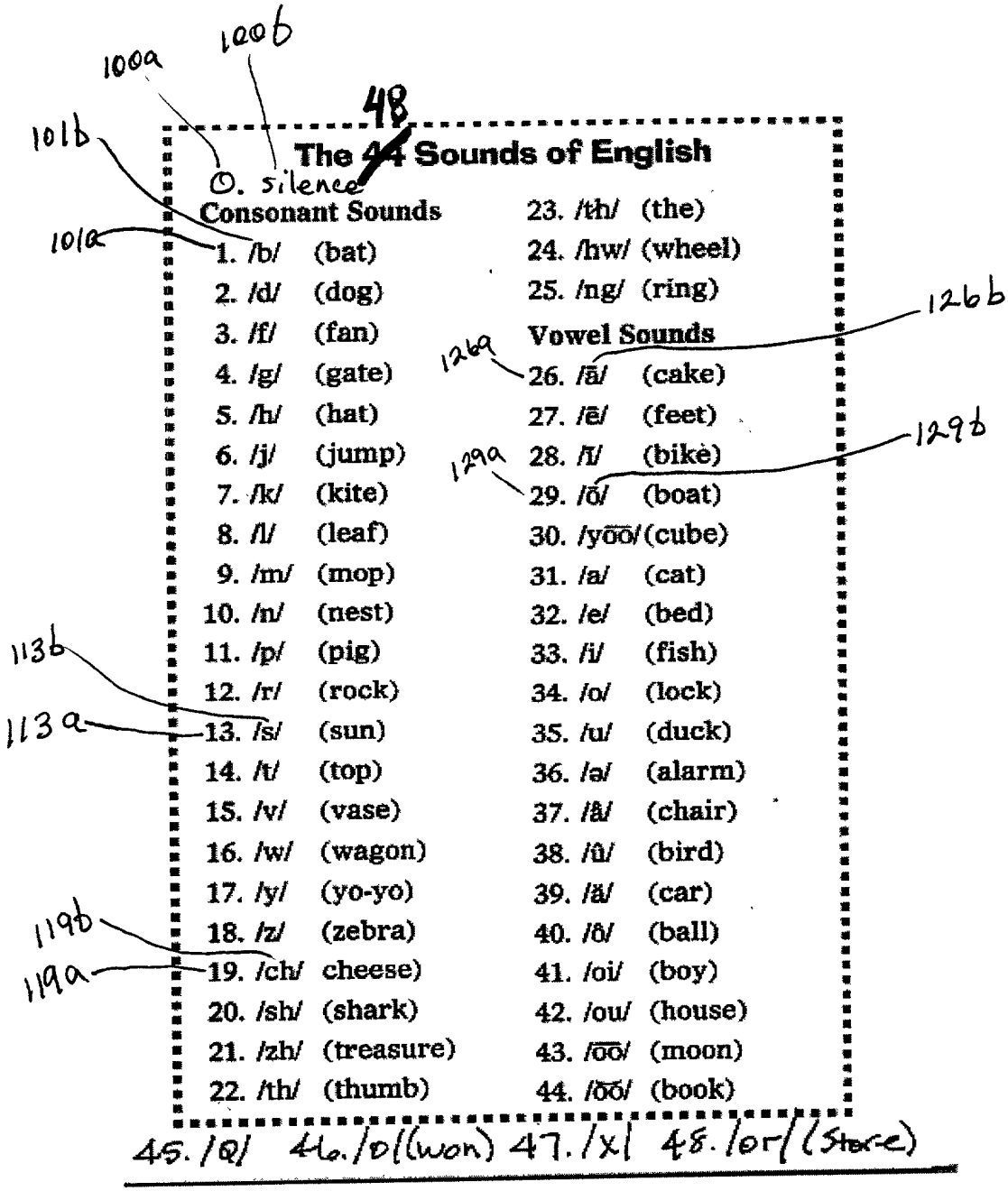

100a
100b
48
101b
The 44 Sounds of English
0. silence
Consonant Sounds
101a
1. /b/ (bat)
2. /d/ (dog)
3. /f/ (fan)
4. /g/ (gate)
5. /h/ (hat)
6. /j/ (jump)
7. /k/ (kite)
8. /l/ (leaf)
9. /m/ (mop)
10. /n/ (nest)
11. /p/ (pig)
12. /r/ (rock)
113b
113a
13. /s/ (sun)
14. /t/ (top)
15. /v/ (vase)
16. /w/ (wagon)
17. /y/ (yo-yo)
18. /z/ (zebra)
119b
119a
19. /ch/ cheese)
20. /sh/ (shark)
21. /zh/ (treasure)
22. /th/ (thumb)
23. /th/ (the)
24. /hw/ (wheel)
25. /ng/ (ring)
Vowel Sounds
126b
126a
26. /ā/ (cake)
27. /ē/ (feet)
129b
129a
28. /ī/ (bike)
29. /ō/ (boat)
30. /yōō/(cube)
31. /a/ (cat)
32. /e/ (bed)
33. /i/ (fish)
34. /o/ (lock)
35. /u/ (duck)
36. /ə/ (alarm)
37. /â/ (chair)
38. /û/ (bird)
39. /ä/ (car)
40. /ô/ (ball)
41. /oi/ (boy)
42. /ou/ (house)
43. /o͞o/ (moon)
44. /o͝o/ (book)
45. /Q/ 46. /o/(won) 47. /x/ 48. /or/(Store)

FIG. 6

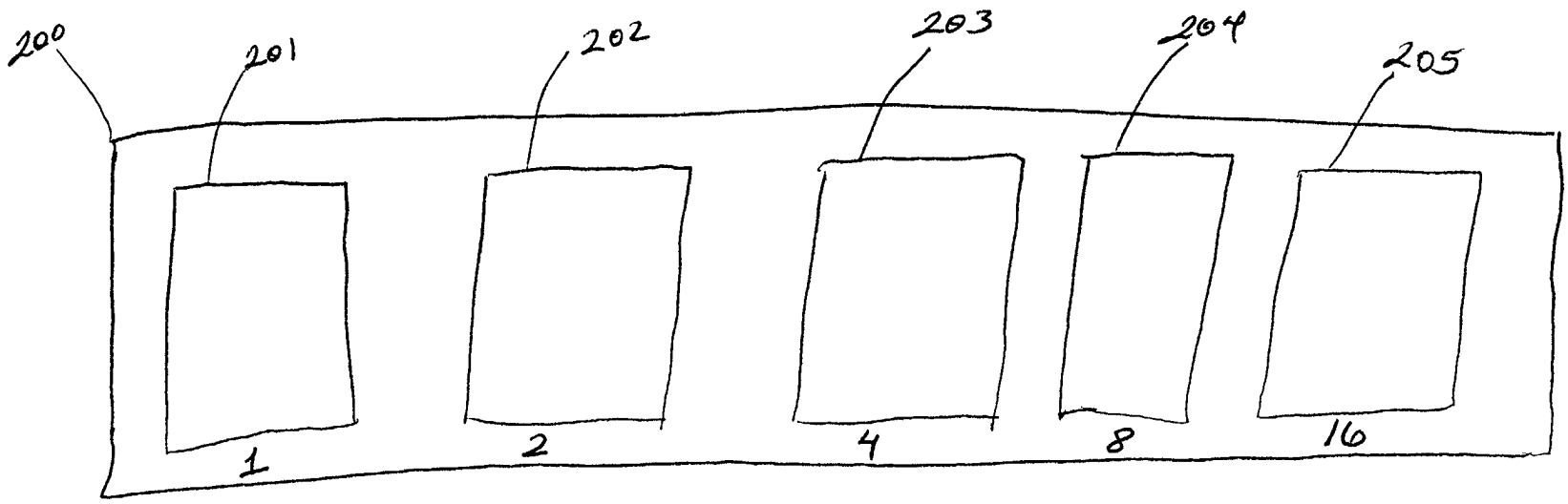


FIG. 7a

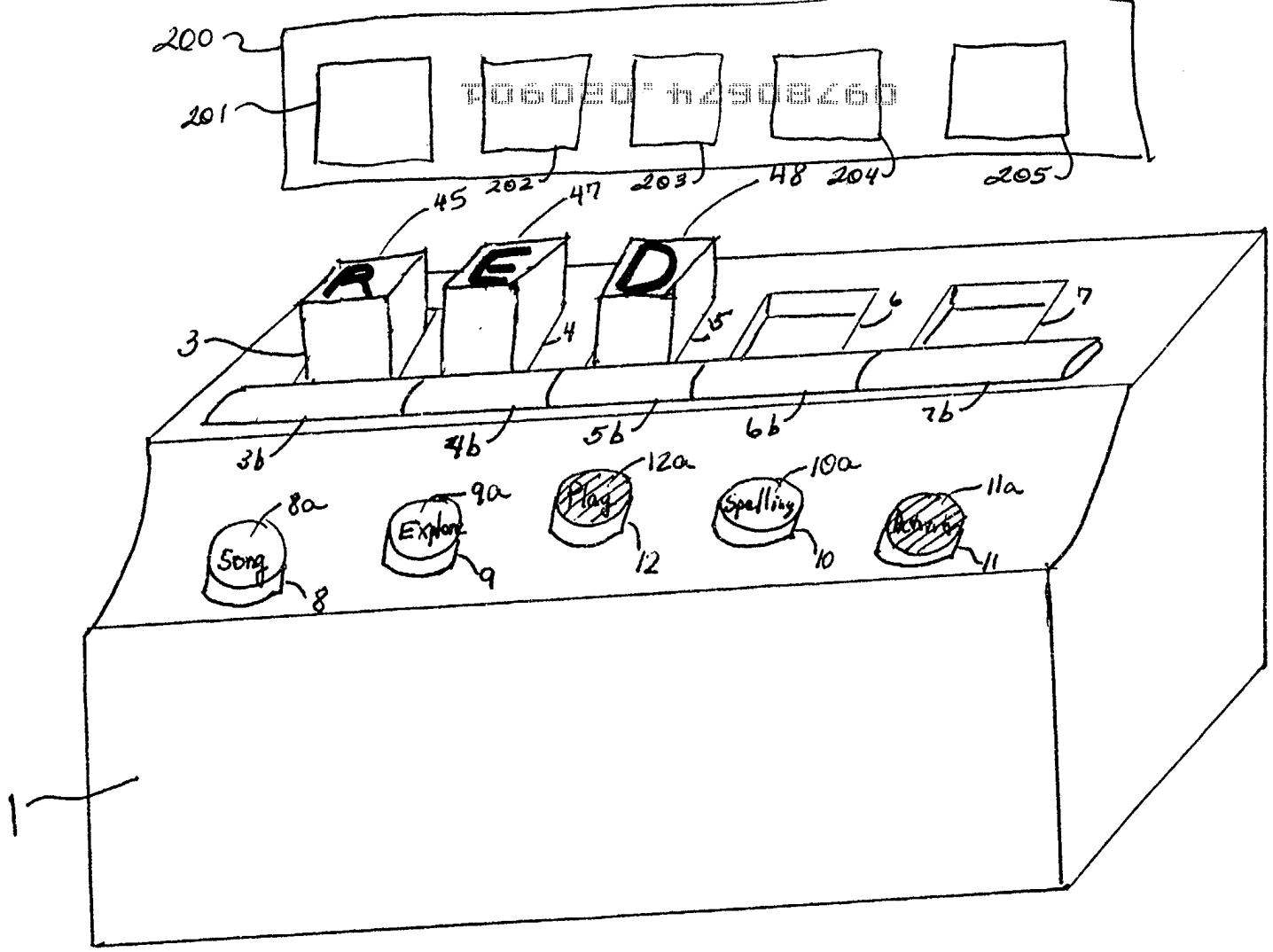

200
201
202
203
204
205
45
47
48
R
E
D
3
4
5
6
7
3b
4b
5b
6b
7b
8a
9a
12a
10a
11a
Song
Explore
Play
Spelling
8
9
12
10
11
1

FiG. 7b

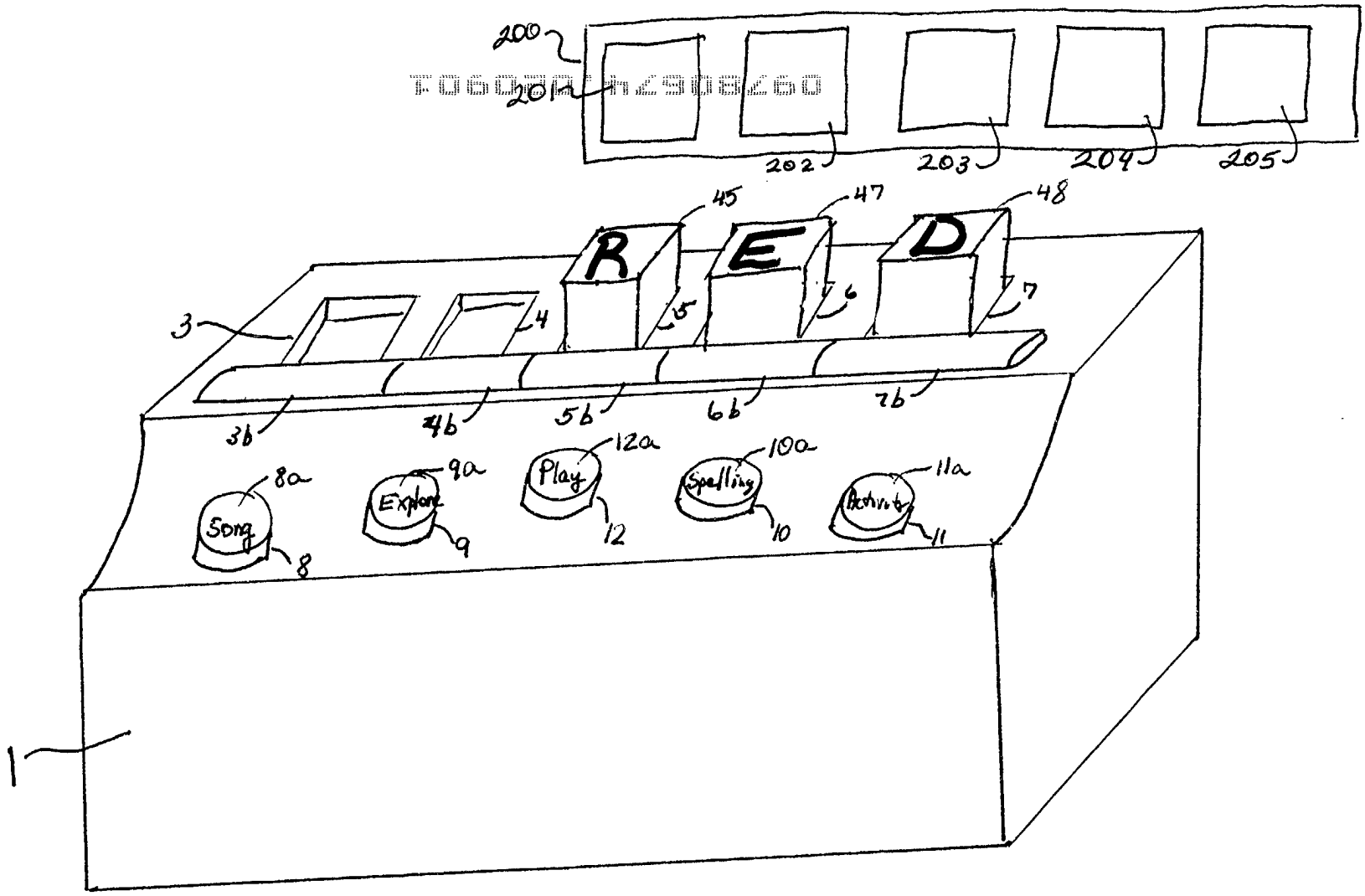

200
201
202
203
204
205
R
E
D
45
47
48
3
4
5
6
7
3b
4b
5b
6b
7b
8a
9a
12a
10a
11a
Song
Explore
Play
Spelling
Activity
8
9
12
10
11
1

FIG. 7C

```
1.  /worddict 2048 dict dup begin
2.  /a [ "a" [ "26" ] [ "01" ] true] def
3.  /i [ "i" [ "28" ] [ "01" ] true ] def
4.  /am [ "am" [ "31"  "9" ] [ "01" "02" ] true ] def
5.  /an [ "an" [ "31" "10" ] [ "01" "02" ] true ] def
6.  /as [ "as" [ "31" "18" ] [ "01" "02" ] true ] def
7.  /at [ "at" [ "31" "14" ] [ "01" "02" ] true ] def
8.  /be [ "be" [  "1" "27" ] [ "01" "02" ] true ] def
9.  /by [ "by" [  "1" "28" ] [ "01" "02" ] true ] def
10. /do [ "do" [  "2" "43" ] [ "01" "02" ] true ] def
11. /go [ "go" [  "4" "29" ] [ "01" "02" ] true ] def
12. /he [ "he" [  "5" "27" ] [ "01" "02" ] true ] def
13. /if [ "if" [ "33"  "3" ] [ "01" "02" ] true ] def
14. /in [ "in" [ "33" "10" ] [ "01" "02" ] true ] def
15. /is [ "is" [ "33" "18" ] [ "01" "02" ] true ] def
16. /it [ "it" [ "33" "14" ] [ "01" "02" ] true ] def
17. /me [ "me" [  "9" "27" ] [ "01" "02" ] true ] def
18. /my [ "my" [  "9" "28" ] [ "01" "02" ] true ] def
19. /no [ "know" [ "10" "29" ] [ "01" "02" ] true ] def
20. /of [ "of" [ "36" "15" ] [ "01" "02" ] true ] def
21. /on [ "on" [ "34" "10" ] [ "01" "02" ] true ] def
22. /or [ "or" [ "29" "12" ] [ "01" "02" ] true ] def
23. /ox [ "ox" [ "34" "47" ] [ "01" "02" ] true ] def
24. /so [ "sew" [ "13" "29" ] [ "01" "02" ] false ] def
25. /to [ "to" [ "14" "43" ] [ "01" "02" ] true ] def
26. /up [ "up" [ "35" "11" ] [ "01" "02" ] true ] def
27. /us [ "us" [ "35" "13" ] [ "01" "02" ] true ] def
28. /we [ "we" [ "16" "27" ] [ "01" "02" ] true ] def
29. /ace  [ "ace" [ "26" "13"  "0" ] [ "05" "02" "05" ] true ] def
30. /act  [ "act" [ "31"  "7" "14" ] [ "01" "02" "04" ] true ] def
31. /age  [ "age" [ "26"  "6"  "0" ] [ "05" "02" "05" ] true ] def
32. /ago  [ "ago" [ "36" "4" "29" ] [ "01" "02" "04" ] true ] def
33. /air  [ "air" [ "37" "37" "12" ] [ "03" "03" "04" ] true ] def
34. /all  [ "all" [ "40"  "8"  "8" ] [ "01" "02" "04" ] true ] def
35. /and  [ "and" [ "31" "10"  "2" ] [ "01" "02" "04" ] true ] def
36. /ant  [ "ant" [ "31" "10" "14" ] [ "01" "02" "04" ] true ] def
37. /any  [ "any" [ "32" "10" "27" ] [ "01" "02" "04" ] true ] def
38. /ape  [ "ape" [ "26" "11"  "0" ] [ "05" "02" "05" ] true ] def
39. /are  [ "are" [ "39" "12"  "0" ] [ "03" "03" "04" ] true ] def
40. /arm  [ "arm" [ "39" "12"  "9" ] [ "03" "03" "04" ] true ] def
41. /art  [ "art" [ "39" "12" "14" ] [ "03" "03" "04" ] true ] def
42. /ask  [ "ask" [ "31" "13"  "7" ] [ "01" "02" "04" ] true ] def
43. /ate  [ "ate" [ "26" "14"  "0" ] [ "05" "02" "05" ] true ] def
44. /bad  [ "bad" [  "1" "31"  "2" ] [ "01" "02" "04" ] true ] def
45. /bag  [ "bag" [  "1" "31"  "4" ] [ "01" "02" "04" ] true ] def
46. /bar  [ "bar" [  "1" "39" "12" ] [ "01" "02" "04" ] true ] def
```

302 301 303 304 305 306 307 308 309 300

FIG. 8a

47. /bat ["bat" ["1" "31" "14"] ["01" "02" "04"] true] def
48. /bed ["bed" ["1" "32" "2"] ["01" "02" "04"] true] def
49. /bee ["bee" ["1" "27" "27"] ["01" "06" "06"] true] def
50. /bet ["bet" ["1" "32" "14"] ["01" "02" "04"] true] def
51. /big ["big" ["1" "33" "4"] ["01" "02" "04"] true] def
52. /bit ["bit" ["1" "33" "14"] ["01" "02" "04"] true] def
53. /bow ["bow" ["1" "29" "29"] ["01" "06" "06"] true] def
54. /box ["box" ["1" "34" "47"] ["01" "02" "04"] true] def
55. /boy ["boy" ["1" "41" "41"] ["01" "06" "06"] true] def
56. /bud ["bud" ["1" "35" "2"] ["01" "02" "04"] true] def
57. /bug ["bug" ["1" "35" "4"] ["01" "02" "04"] true] def
58. /bun ["bun" ["1" "35" "10"] ["01" "02" "04"] true] def
59. /bus ["bus" ["1" "35" "13"] ["01" "02" "04"] true] def
60. /but ["but" ["1" "35" "14"] ["01" "02" "04"] true] def
61. /buy ["by" ["1" "28" "28"] ["01" "06" "06"] true] def
62. /bye ["by" ["1" "28" "0"] ["01" "06" "06"] true] def
63. /cab ["cab" ["7" "31" "1"] ["01" "02" "04"] true] def
64. /can ["can" ["7" "31" "10"] ["01" "02" "04"] true] def
65. /cap ["cap" ["7" "31" "11"] ["01" "02" "04"] true] def
66. /car ["car" ["7" "39" "12"] ["01" "02" "04"] true] def
67. /cat ["cat" ["7" "31" "14"] ["01" "02" "04"] true] def
68. /cop ["cop" ["7" "34" "11"] ["01" "02" "04"] true] def
69. /cow ["cow" ["7" "42" "42"] ["01" "06" "06"] true] def
70. /cry ["cry" ["7" "12" "28"] ["01" "02" "04"] true] def
71. /cup ["cup" ["7" "36" "11"] ["01" "02" "04"] true] def
72. /cut ["cut" ["7" "36" "14"] ["01" "02" "04"] true] def
73. /dad ["dad" ["2" "31" "2"] ["01" "02" "04"] true] def
74. /day ["day" ["2" "26" "26"] ["01" "06" "06"] true] def
75. /den ["den" ["2" "32" "10"] ["01" "02" "04"] true] def
76. /did ["did" ["2" "33" "2"] ["01" "02" "04"] true] def
77. /dig ["dig" ["2" "33" "4"] ["01" "02" "04"] true] def
78. /dog ["dog" ["2" "40" "4"] ["01" "02" "04"] true] def
79. /dot ["dot" ["2" "34" "14"] ["01" "02" "04"] true] def
80. /dry ["dry" ["2" "12" "28"] ["01" "02" "04"] true] def
81. /ear ["ear" ["27" "27" "12"] ["03" "03" "04"] true] def
82. /eat ["eat" ["27" "27" "14"] ["03" "03" "04"] true] def
83. /egg ["egg" ["32" "4" "4"] ["01" "06" "06"] true] def
84. /end ["end" ["32" "10" "2"] ["01" "02" "04"] true] def
85. /eye ["eye" ["28" "28" "0"] ["04" "05" "07"] true] def
86. /fan ["fan" ["3" "31" "10"] ["01" "02" "04"] true] def
87. /far ["far" ["3" "39" "12"] ["01" "02" "04"] true] def
88. /fat ["fat" ["3" "31" "14"] ["01" "02" "04"] true] def
89. /fed ["fed" ["3" "32" "2"] ["01" "02" "04"] true] def
90. /few ["few" ["3" "30" "30"] ["01" "06" "06"] true] def
91. /fit ["fit" ["3" "33" "14"] ["01" "02" "04"] true] def
92. /fix ["fix" ["3" "33" "47"] ["01" "02" "04"] true] def
93. /fly ["fly" ["3" "8" "28"] ["01" "02" "04"] true] def
94. /for ["for" ["3" "29" "12"] ["01" "02" "04"] true] def
95. /fox ["fox" ["3" "34" "47"] ["01" "02" "04"] true] def
96. /fry ["fry" ["3" "12" "28"] ["01" "02" "04"] true] def
97. /fun ["fun" ["3" "36" "10"] ["01" "02" "04"] true] def
98. /fur ["fur" ["3" "38" "12"] ["01" "02" "04"] true] def
99. /gap ["gap" ["4" "31" "11"] ["01" "02" "04"] true] def
100./get ["get" ["4" "32" "14"] ["01" "02" "04"] true] def

FIG. 8b

```
101./gnu  [ "gnu" [  "0" "10" "43" ] [ "03" "02" "04" ] true ] def
102./got  [ "got" [  "4" "34" "14" ] [ "01" "02" "04" ] true ] def
103./gum  [ "gum" [  "4" "35"  "9" ] [ "01" "02" "04" ] true ] def
104./guy  [ "guy" [  "4" "28" "28" ] [ "01" "06" "06" ] true ] def
105./had  [ "had" [  "5" "31"  "2" ] [ "01" "02" "04" ] true ] def
106./ham  [ "ham" [  "5" "31"  "9" ] [ "01" "02" "04" ] true ] def
107./has  [ "has" [  "5" "31" "18" ] [ "01" "02" "04" ] true ] def
108./hat  [ "hat" [  "5" "31" "14" ] [ "01" "02" "04" ] true ] def
109./hay  [ "hay" [  "5" "26" "26" ] [ "01" "06" "06" ] true ] def
110./hen  [ "hen" [  "5" "32" "10" ] [ "01" "02" "04" ] true ] def
111./her  [ "her" [  "5" "38" "12" ] [ "01" "02" "04" ] true ] def
112./hey  [ "hay" [  "5" "26" "26" ] [ "01" "06" "06" ] false ] def
113./hid  [ "hid" [  "5" "33"  "2" ] [ "01" "02" "04" ] true ] def
114./him  [ "him" [  "5" "33"  "9" ] [ "01" "02" "04" ] true ] def
115./hip  [ "hip" [  "5" "33" "11" ] [ "01" "02" "04" ] true ] def
116./his  [ "his" [  "5" "33" "18" ] [ "01" "02" "04" ] true ] def
117./hit  [ "hit" [  "5" "33" "14" ] [ "01" "02" "04" ] true ] def
118./hog  [ "hog" [  "5" "34"  "4" ] [ "01" "02" "04" ] true ] def
119./hop  [ "hop" [  "5" "34" "11" ] [ "01" "02" "04" ] true ] def
120./hot  [ "hot" [  "5" "34" "14" ] [ "01" "02" "04" ] true ] def
121./how  [ "how" [  "5" "42" "42" ] [ "01" "06" "06" ] true ] def
122./hug  [ "hug" [  "5" "35"  "4" ] [ "01" "02" "04" ] true ] def
123./hum  [ "hum" [  "5" "35"  "9" ] [ "01" "02" "04" ] true ] def
124./hut  [ "hut" [  "5" "35" "14" ] [ "01" "02" "04" ] true ] def
125./ice  [ "ice" [ "28" "13"  "0" ] [ "05" "02" "05" ] true ] def
126./ink  [ "ink" [ "33" "10"  "7" ] [ "01" "02" "04" ] true ] def
127./jam  [ "jam" [  "6" "31" " 9" ] [ "01" "02" "04" ] true ] def
128./jar  [ "jar" [  "6" "39" "12" ] [ "01" "06" "04" ] true ] def
129./jaw  [ "jaw" [  "6" "40" "40" ] [ "01" "05" "04" ] true ] def
130./jet  [ "jet" [  "6" "32" "14" ] [ "01" "02" "04" ] true ] def
131./job  [ "job" [  "6" "40"  "1" ] [ "01" "02" "04" ] true ] def
132./jog  [ "jog" [  "6" "40"  "4" ] [ "01" "02" "04" ] true ] def
133./joy  [ "joy" [  "6" "41" "41" ] [ "01" "06" "06" ] true ] def
134./jug  [ "jug" [  "6" "35" "4" ] [ "01" "02" "04 ] true ] def
135./key  [ "key" [  "7" "27" "27" ] [ "01" "06" "06" ] true ] def
136./kid  [ "kid" [  "7" "33"  "2" ] [ "01" "02" "04" ] true ] def
137./kit  [ "kit" [  "7" "33" "14" ] [ "01" "02" "04" ] true ] def
138./lab  [ "lab" [  "8" "31"  "1" ] [ "01" "02" "04" ] true ] def
139./lay  [ "lay" [  "8" "26" "26" ] [ "01" "06" "06" ] true ] def
140./leg  [ "leg" [  "8" "32"  "4" ] [ "01" "02" "04" ] true ] def
141./let  [ "let" [  "8" "32" "14" ] [ "01" "02" "04" ] true ] def
142./lid  [ "lid" [  "8" "33"  "2" ] [ "01" "02" "04" ] true ] def
143./lie  [ "lie" [  "8" "28"  "0" ] [ "01" "06" "06" ] true ] def
144./lip  [ "lip" [  "8" "33" "11" ] [ "01" "02" "04" ] true ] def
145./log  [ "log" [  "8" "34"  "4" ] [ "01" "02" "04" ] true ] def
146./lot  [ "lot" [  "8" "34"  "14" ] [ "01" "02" "04" ] true ] def
147./mad  [ "mad" [  "9" "31"  "2" ] [ "01" "02" "04" ] true ] def
148./man  [ "man" [  "9" "31" "10" ] [ "01" "02" "04" ] true ] def
149./map  [ "map" [  "9" "31" "11" ] [ "01" "02" "04" ] true ] def
150./mat  [ "mat" [  "9" "31" "14" ] [ "01" "02" "04" ] true ] def
151./may  [ "may" [  "9" "26"  "26" ] [ "01" "06" "06" ] true ] def
152./men  [ "men" [  "9" "32" "10" ] [ "01" "02" "04" ] true ] def
153./met  [ "met" [  "9" "32" "14" ] [ "01" "02" "04" ] true ] def
154./mix  [ "mix" [  "9" "33" "47" ] [ "01" "02" "04" ] true ] def
```

FIG. 8C

```
155./mom  [ "mom" [ "9" "34" "9" ] [ "01" "02" "04" ] true ] def
156./moo  [ "moo" [ "9" "43" "43" ] [ "01" "06" "06" ] true ] def
157./mop  [ "mop" [ "9" "34" "11" ] [ "01" "02" "04" ] true ] def
158./mud  [ "mud" [ "9" "35" "2" ] [ "01" "02" "04" ] true ] def
159./mug  [ "mug" [ "9" "35" "4" ] [ "01" "02" "04" ] true ] def
160./nap  [ "nap" [ "10" "31" "11" ] [ "01" "02" "04" ] true ] def
161./net  [ "net" [ "10" "32" "14" ] [ "01" "02" "04" ] true ] def
162./new  [ "new" [ "10" "43" "43" ] [ "01" "06" "06" ] true ] def
163./nod  [ "nod" [ "10" "34" "2" ] [ "01" "02" "04" ] true ] def
164./not  [ "not" [ "10" "34" "14" ] [ "01" "02" "04" ] true ] def
165./now  [ "now" [ "10" "42" "42" ] [ "01" "06" "06" ] true ] def
166./nut  [ "nut" [ "10" "35" "14" ] [ "01" "02" "04" ] true ] def
167./off  [ "off" [ "34" "3" "3" ] [ "01" "06" "06" ] true ] def
168./oil  [ "oil" [ "41" "41" "8" ] [ "03" "03" "04" ] true ] def
169./old  [ "old" [ "29" "8" "2" ] [ "01" "02" "04" ] true ] def
170./one  [ "one" [ "16" "10" "0" ] [ "01" "02" "04" ] true ] def
171./our  [ "our" [ "42" "42" "12" ] [ "03" "03" "04" ] true ] def
172./out  [ "out" [ "42" "42" "14" ] [ "03" "03" "04" ] true ] def
173./owl  [ "owl" [ "42" "42" "8" ] [ "01" "02" "04" ] true ] def
174./own  [ "own" [ "29" "29" "10" ] [ "01" "02" "04" ] true ] def
175./pad  [ "pad" [ "11" "31" "2" ] [ "01" "02" "04" ] true ] def
176./pal  [ "pal" [ "11" "31" "8" ] [ "01" "02" "04" ] true ] def
177./pan  [ "pan" [ "11" "31" "10" ] [ "01" "02" "04" ] true ] def
178./pat  [ "pat" [ "11" "31" "14" ] [ "01" "02" "04" ] true ] def
179./pea  [ "pea" [ "11" "27" "27" ] [ "01" "06" "06" ] true ] def
180./pen  [ "pen" [ "11" "32" "10" ] [ "01" "02" "04" ] true ] def
181./pet  [ "pet" [ "11" "32" "14" ] [ "01" "02" "04" ] true ] def
182./pie  [ "pie" [ "11" "28" "28" ] [ "01" "06" "06" ] true ] def
183./pig  [ "pig" [ "11" "33" "4" ] [ "01" "02" "04" ] true ] def
184./pin  [ "pin" [ "11" "33" "10" ] [ "01" "02" "04" ] true ] def
185./pit  [ "pit" [ "11" "33" "14" ] [ "01" "02" "04" ] true ] def
186./pop  [ "pop" [ "11" "34" "11" ] [ "01" "02" "04" ] true ] def
187./pot  [ "pot" [ "11" "34" "14" ] [ "01" "02" "04" ] true ] def
188./put  [ "put" [ "11" "36" "14" ] [ "01" "02" "04" ] true ] def
189./rag  [ "rag" [ "12" "31" "8" ] [ "01" "02" "04" ] true ] def
190./ram  [ "ram" [ "12" "31" "9" ] [ "01" "02" "04" ] true ] def
191./ran  [ "ran" [ "12" "31" "10" ] [ "01" "02" "04" ] true ] def
192./rap  [ "rap" [ "12" "31" "11" ] [ "01" "02" "04" ] true ] def
193./rat  [ "rat" [ "12" "31" "14" ] [ "01" "02" "04" ] true ] def
194./raw  [ "raw" [ "12" "34" "34" ] [ "01" "06" "06" ] true ] def
195./ray  [ "ray" [ "12" "26" "26" ] [ "01" "06" "06" ] true ] def
196./red  [ "red" [ "12" "31" "2" ] [ "01" "02" "04" ] true ] def
197./rib  [ "rib" [ "12" "33" "1" ] [ "01" "02" "04" ] true ] def
198./rid  [ "rid" [ "12" "33" "2" ] [ "01" "02" "04" ] true ] def
199./rip  [ "rip" [ "12" "33" "11" ] [ "01" "02" "04" ] true ] def
200./rod  [ "rod" [ "12" "34" "2" ] [ "01" "02" "04" ] true ] def
201./rot  [ "rot" [ "12" "34" "14" ] [ "01" "02" "04" ] true ] def
202./row  [ "row" [ "12" "29" "29" ] [ "01" "06" "06" ] true ] def
203./rub  [ "rub" [ "12" "35" "1" ] [ "01" "02" "04" ] true ] def
204./rug  [ "rug" [ "12" "35" "4" ] [ "01" "02" "04" ] true ] def
205./run  [ "run" [ "12" "35" "10" ] [ "01" "02" "04" ] true ] def
206./sad  [ "sad" [ "13" "31" "2" ] [ "01" "02" "04" ] true ] def
207./sat  [ "sat" [ "13" "31" "14" ] [ "01" "02" "04" ] true ] def
208./saw  [ "saw" [ "13" "40" "40" ] [ "01" "06" "06" ] true ] def
```

FIG. 8d

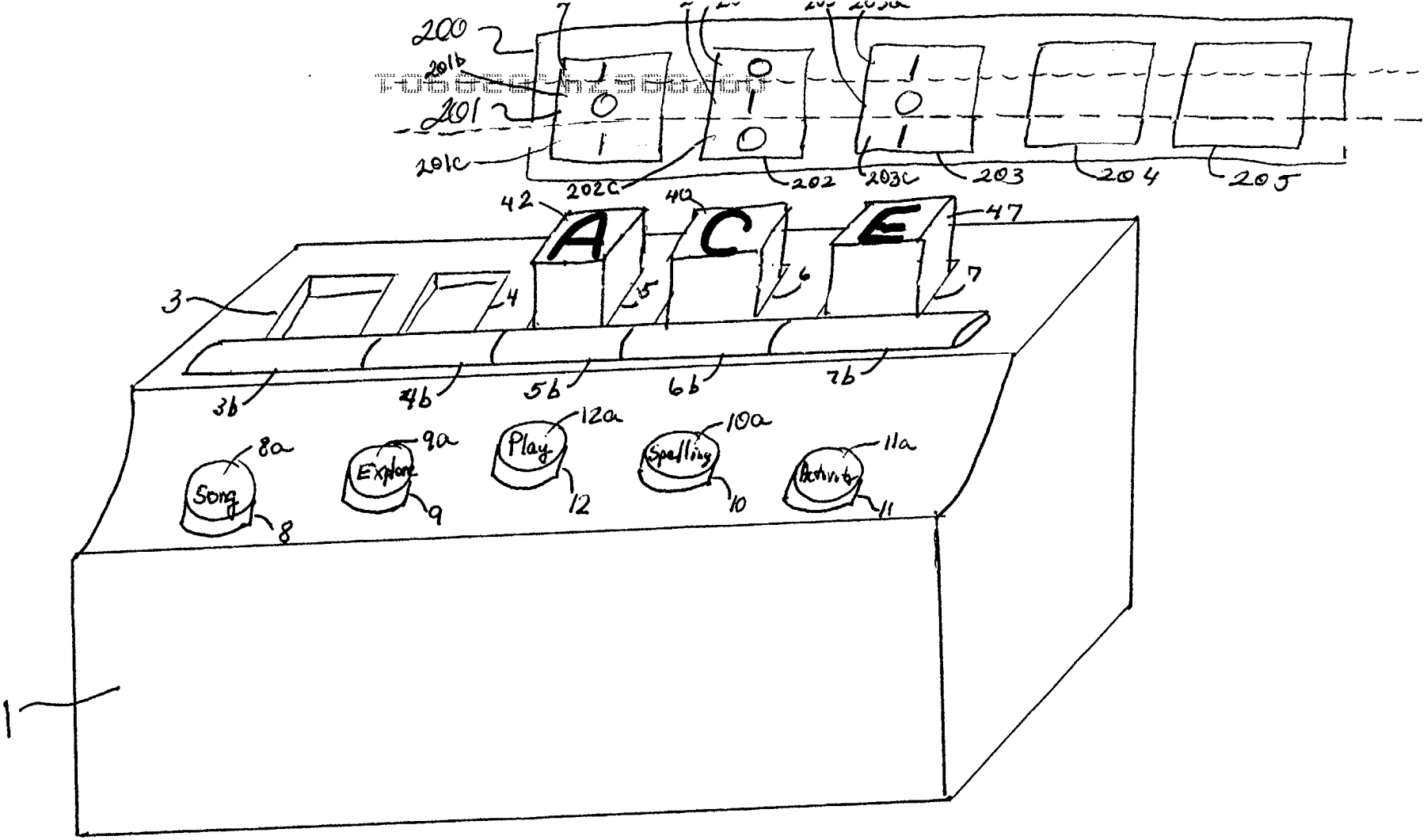

200
201b
201
201c
202c
202
203c
203
204
205
42
40
47
A
C
E
3
4
5
6
7
3b
4b
5b
6b
7b
8a
9a
12a
10a
11a
Song
Explore
Play
Spelling
Activity
8
9
12
10
11
1

FIG. 9

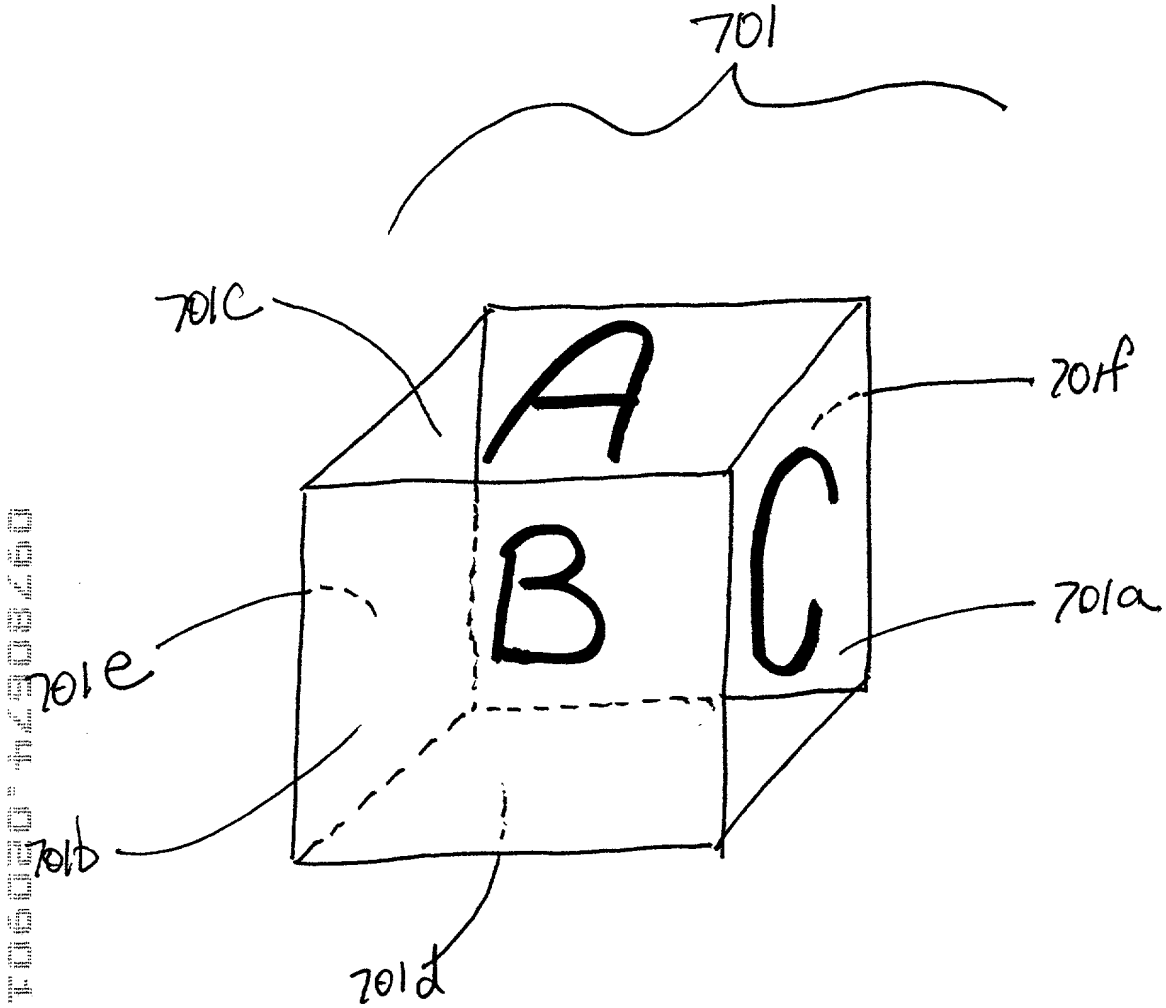


FIG. 10

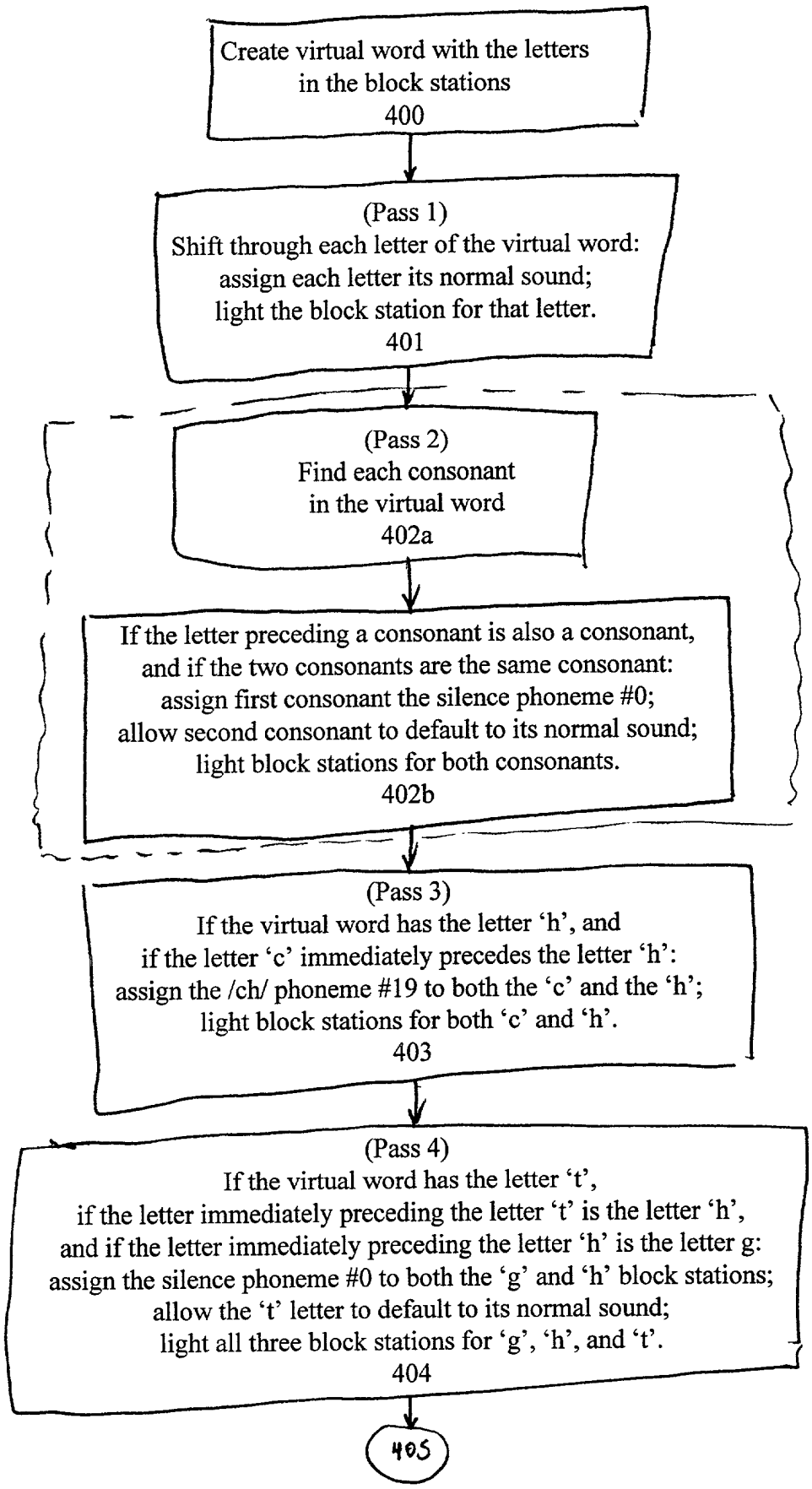

Create virtual word with the letters in the block stations
400
(Pass 1)
Shift through each letter of the virtual word:
assign each letter its normal sound;
light the block station for that letter.
401
(Pass 2)
Find each consonant
in the virtual word
402a
If the letter preceding a consonant is also a consonant,
and if the two consonants are the same consonant:
assign first consonant the silence phoneme #0;
allow second consonant to default to its normal sound;
light block stations for both consonants.
402b
(Pass 3)
If the virtual word has the letter 'h', and
if the letter 'c' immediately precedes the letter 'h':
assign the /ch/ phoneme #19 to both the 'c' and the 'h';
light block stations for both 'c' and 'h'.
403
(Pass 4)
If the virtual word has the letter 't',
if the letter immediately preceding the letter 't' is the letter 'h',
and if the letter immediately preceding the letter 'h' is the letter g:
assign the silence phoneme #0 to both the 'g' and 'h' block stations;
allow the 't' letter to default to its normal sound;
light all three block stations for 'g', 'h', and 't'.
404
405

FIG. 11a

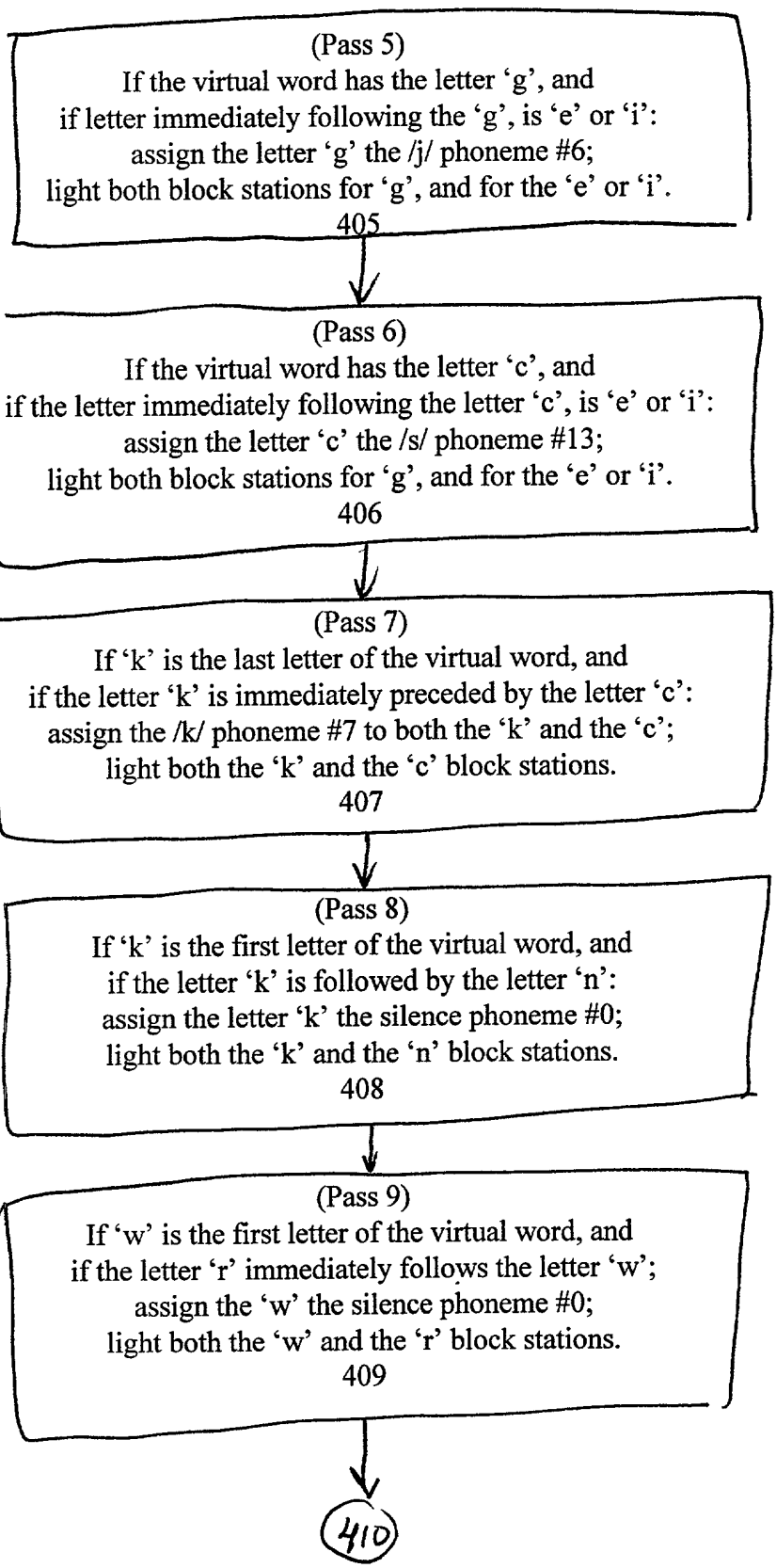

(Pass 5)
If the virtual word has the letter 'g', and
if letter immediately following the 'g', is 'e' or 'i':
assign the letter 'g' the /j/ phoneme #6;
light both block stations for 'g', and for the 'e' or 'i'.
405
(Pass 6)
If the virtual word has the letter 'c', and
if the letter immediately following the letter 'c', is 'e' or 'i':
assign the letter 'c' the /s/ phoneme #13;
light both block stations for 'g', and for the 'e' or 'i'.
406
(Pass 7)
If 'k' is the last letter of the virtual word, and
if the letter 'k' is immediately preceded by the letter 'c':
assign the /k/ phoneme #7 to both the 'k' and the 'c';
light both the 'k' and the 'c' block stations.
407
(Pass 8)
If 'k' is the first letter of the virtual word, and
if the letter 'k' is followed by the letter 'n':
assign the letter 'k' the silence phoneme #0;
light both the 'k' and the 'n' block stations.
408
(Pass 9)
If 'w' is the first letter of the virtual word, and
if the letter 'r' immediately follows the letter 'w';
assign the 'w' the silence phoneme #0;
light both the 'w' and the 'r' block stations.
409
410

FIG. 11b

(Pass 10)
If the virtual word has the letter 'e', and
if a second letter 'e' precedes or follows the first letter 'e';
assign both letters 'e' the /ē/ phoneme #27;
light the block stations for both 'e' letters.
410

(Pass 11)
If the virtual word has the letter 'r', and
if the letter 'r' is immediately preceded by a vowel, then:
if the vowel is the letter 'i', assign the letter 'i' the /û/ phoneme #38;
else if the vowel is the letter 'u', assign the letter 'u' the /û/ phoneme #38;
else if the vowel is the letter 'e', assign the letter 'e' the /û/ phoneme #38;
else if the vowel is the letter 'a', assign the letter 'a' the /ä/ phoneme #39;
else if the vowel is the letter 'o', assign the letter 'o' the /ö/ phoneme #48;
light the block stations for the vowel and the letter 'r'.
411

(Pass 12)
If the virtual word has the letter 'r', and
if the letter 'r' is immediately preceded by the letter 'a' or the letter 'o', and
if the letter 'r' is immediately followed by the letter 'e':
assign the letter 'e' the silence phoneme #0;
if the letter preceding the letter 'r' is the letter 'a', then assign the letter 'a' the /â/ phoneme #37;
else if the letter preceding the letter 'r' is the letter 'o', then assign the letter 'o' the /ö/ phoneme #48;
light the block stations for the letter 'r', and 'e', and for the letters 'a' or 'o'.
412

(Pass 13)
If the virtual word ends in the letter 'y', and
if the virtual word has no vowels:
assign the letter 'y' the /ī/ phoneme #28;
else if the virtual word ends in the letter 'y', and
if the virtual word has at least one vowel:
assign the letter 'y' the /ē/ phoneme #27.
413

414

Fig. 11C

(Pass 14)
If the virtual word has the letter 'y', and
if the letter immediately preceding the letter 'y' is the letter 'a':
assign the letter 'y' the silence phoneme #0;
assign the letter 'a' the /ā/ phoneme #26;
light the block stations for both the 'a' and the 'y'.
414

(Pass 15)
If the last letter in the virtual word is a vowel, and
If there is only one vowel in the virtual word, then:
if the vowel is the letter 'e', assign the letter 'e' the /ē/ phoneme #27;
else if the vowel is the letter 'i', assign the letter 'i' the /ī/ phoneme #28;
else if the vowel is the letter 'o', assign the letter 'o' the /ō/ phoneme #29.
415

(Pass 16)
If the virtual word has the letter 'h', and
if the letter 'h' is immediately preceded by the letter 'g', and
if the letter 'g' is immediately preceded by the letter 'i', then:
assign the silence phoneme #0 to both the letters 'g' and 'h';
assign the /ī/ phoneme 28 to the letter 'i';
light the block stations for the letters 'i', 'g', and 'h'.
416

(Pass 17)
If the virtual word has the letter 'o', and
if the letter 'o' is immediately preceded by or immediately followed by another letter 'o',
then:
assign both letter 'o's the /ōō/ phoneme #43; and
light the block stations for both letter 'o's.
417

(Pass 18)
If the virtual word has the letter 'w', and
if the letter 'w' is immediately preceded by the letter 'e', then:
assign both letter 'e' and letter 'w' the /ōō/ phoneme #43; and
light the block stations for both letters.
418

419

FiG. 11d

(Pass 19)
If the virtual word has the letter 'u', and
if the letter 'u' is immediately followed by a consonant, and
if the consonant is immediately followed by the letter 'e', then:
assign the letter 'e' the silence phoneme #0;
assign the letter 'u' the /ōō/ phoneme #43; and
light the block station for the letter 'u' and the block station for the letter 'e'.
419

(Pass 20)
If the virtual word has the letter 'o', and
if the letter 'o' is immediately followed by the letter 'u', then:
assign the letters 'o' and 'u' the /ou/ phoneme #42.; and
light the block station for the letter 'o' and the block station for the letter 'u'.
420

(Pass 21)
If the virtual word has the letter 'g', and
if the letter 'g' is immediately followed by the letter 'n', then:
assign the letter 'g' the silence phoneme #0;
the letter 'n' defaults to its normal sound; and
light the block station for the letter 'g' and the block station for the letter 'n'.
421

(Pass 22)
If the virtual word has the letter 'y', and
if the letter 'y' is immediately preceded by the letter 'o', then:
assign the letter 'o' the /oi/ phoneme #41;
assign the letter 'y' the /oi/ phoneme #41; and
light the block station for the letter 'o' and the block station for the letter 'y'.
422

(Pass 23)
If the virtual word has the letter 'h', and
if the letter 'h' is directly preceded by the letter 'w', then:
assign the letter 'w' the /hw/ phoneme #24;
assign the letter 'h' the /hw/ phoneme #24; and
light the block station for the letter 'w' and the block station for the letter 'h'.
423

424

FiG. 11e

(Pass 24)
If the virtual word has two vowels, and
if the word ends in the letter 'e', and
if the letter that directly precedes the letter 'e' is a consonant, then:
assign the letter 'e' the silence phoneme #0;
if the letter directly preceding the consonant is the letter 'a', assign the letter 'a' the /ā/ phoneme #26;
else if the letter directly preceding the consonant is the letter 'e', assign the letter 'e' the /ē/ phoneme #27;
else if the letter directly preceding the consonant is the letter 'i', assign the letter 'i' the /ī/ phoneme #28;
else if the letter directly preceding the consonant is the letter 'o', assign the letter 'o' the /ō/ phoneme #29;
else if the letter directly preceding the consonant is the letter 'u', assign the letter 'u' the /ū/ phoneme #43; and
light the block station for the letter 'e' and the block station for the vowel that directly precedes the consonant.
424

(Pass 25)
If the virtual word has two vowels, and
if the word ends in the letters 'ed', and
if the letter that directly precedes the letter 'e' is a consonant, then:
assign the letter 'e' the silence phoneme #0;
if the letter directly preceding the consonant is the letter 'a', assign the letter 'a' the /ā/ phoneme #26;
else if the letter directly preceding the consonant is the letter 'e', assign the letter 'e' the /ē/ phoneme #27;
else if the letter directly preceding the consonant is the letter 'i', assign the letter 'i' the /ī/ phoneme #28;
else if the letter directly preceding the consonant is the letter 'o', assign the letter 'o' the /ō/ phoneme #29;
else if the letter directly preceding the consonant is the letter 'u', assign the letter 'u' the /ū/ phoneme #43; and
light the block station for the letter 'e' and the block station for the vowel that directly precedes the consonant.
425

426

FIG. 11f

(Pass 26)
If the virtual word has two vowels, and
if the word ends in the letters 'es', and
if the letter that directly precedes the letter 'e' is a consonant, then:
assign the letter 'e' the silence phoneme #0;
if the letter directly preceding the consonant is the letter 'a', assign the letter 'a' the /ā/ phoneme #26;
else if the letter directly preceding the consonant is the letter 'e', assign the letter 'e' the /ē/ phoneme #27;
else if the letter directly preceding the consonant is the letter 'i', assign the letter 'i' the /ī/ phoneme #28;
else if the letter directly preceding the consonant is the letter 'o', assign the letter 'o' the /ō/ phoneme #29;
else if the letter directly preceding the consonant is the letter 'u', assign the letter 'u' the /ū/ phoneme #43; and
light the block station for the letter 'e' and the block station for the vowel that directly precedes the consonant.
426

(Pass 27)
If the virtual word has two vowels, and
if the word ends in the letters 'er', and
if the letter that directly precedes the letter 'e' is a consonant, then:
assign the letter 'e' the /û/ phoneme #38;
if the letter directly preceding the consonant is the letter 'a', assign the letter 'a' the /ā/ phoneme #26;
else if the letter directly preceding the consonant is the letter 'e', assign the letter 'e' the /ē/ phoneme #27;
else if the letter directly preceding the consonant is the letter 'i', assign the letter 'i' the /ī/ phoneme #28;
else if the letter directly preceding the consonant is the letter 'o', assign the letter 'o' the /ō/ phoneme #29;
else if the letter directly preceding the consonant is the letter 'u', assign the letter 'u' the /ū/ phoneme #43; and
light the block stations for the letters 'e' and 'r' and the block station for the vowel that directly precedes the consonant.
427

428

FIG. 11g

(Pass 28)
If the virtual word has the letter 'u', and
if the letter 'u' is directly preceded by the letter 'q', then:
assign the letter 'q' the /k/ phoneme #7;
assign the letter 'u' the /w/ phoneme #16; and
light the block station for the letter 'q' and the block station for the letter 'u'.
428

(Pass 29)
If the virtual word has the letter 'p', and
if the letter 'p' is directly followed by the letter 'h', then:
assign the letter 'p' the /f/ phoneme #3;
assign the letter 'h' the /f/ phoneme #3; and
light the block station for the letter 'p' and the block station for the letter 'h'.
429

(Pass 30)
If the virtual word has the letter 'n', and
if the letter 'n' is directly followed by the letter 'g', then:
assign the letter 'n' the /ng/ phoneme #25;
assign the letter 'g' the /ng/ phoneme #25; and
light the block station for the letter 'n' and the block station for the letter 'g'.
430

(Pass 31)
If the virtual word has the letter 's', and
if the letter 's' is directly followed by the letter 'h', then:
assign the letter 's' the /sh/ phoneme #20;
assign the letter 'h' the /sh/ phoneme #20; and
light the block station for the letter 's' and the block station for the letter 'h'.
431

(Pass 32)
If the virtual word has the letter 't', and
if the letter 't' is directly followed by the letter 'h', then:
assign the letter 't' the /th/ phoneme #22;
assign the letter 'h' the /th/ phoneme #22; and
light the block station for the letter 't' and the block station for the letter 'h'.
432

433

FIG. 11h

(Pass 33)
If the virtual word has the letter ‘a’, and
if the letter ‘a’ is directly followed by the letter 'w', then:
assign the letter ‘a’ the /ô/ phoneme #40;
assign the letter ‘w’ the /ô/ phoneme #40; and
light the block station for the letter ‘a’ and the block station for the letter ‘w’.
433

(Pass 34)
If the virtual word has the letter ‘a’, and
if the letter ‘a’ is directly followed by the letter 'i', then:
assign the letter ‘a’ the /ā/ phoneme #26;
assign the letter ‘i’ the /ā/ phoneme #26; and
light the block station for the letter ‘a’ and the block station for the letter ‘i’.
434

(Pass 35)
If the virtual word has the letter ‘o’, and
if the letter ‘o’ is directly followed by the letter 'a', then:
assign the letter ‘o’ the /ō/ phoneme #29;
assign the letter ‘a’ the /ō/ phoneme #29; and
light the block station for the letter ‘o’ and the block station for the letter ‘a’.
435

(Pass 36)
If the virtual word has the letter ‘e’, and
if the letter ‘e’ is directly followed by the letter 'a', then:
assign the letter ‘e’ the /ē/ phoneme #27;
assign the letter ‘a’ the /ē/ phoneme #27; and
light the block station for the letter ‘e’ and the block station for the letter ‘a’.
436

437

FIG. 11i

(Pass 37)
If the virtual word has the letter ‘d’, and
if the letter ‘d’ is directly preceded by the letter 'l',
and if the letter ‘l’ is directly preceded by the letter ‘u’, and
if the letter ‘u’ is directly preceded by the letter ‘o’, then:
assign the letter ‘o’ the /ŏŏ/ phoneme #44;
assign the letter ‘u’ the /ŏŏ/ phoneme #44;
assign the letter ‘l’ the silence phoneme #0;
assign the letter ‘d’ the /d/ phoneme #2; and
light the block stations for the letters ‘o’, ‘u’, ‘l’, and ‘d’.
437

(Pass 38)
If the virtual word has the letter ‘n’, and
if the letter ‘n’ is directly preceded by the letter 'o',
and if the letter ‘o’ is directly preceded by the letter ‘i’, and
if the letter ‘i’ is directly preceded by the letter ‘t’, then:
assign the letter ‘t’ the /sh/ phoneme #20;
assign the letter ‘i’ the /sh/ phoneme #20;
assign the letter ‘o’ the /ə/ phoneme #36;
assign the letter ‘n’ the /n/ phoneme #10; and
light the block stations for the letters ‘t’, ‘i’, ‘o’, and ‘n’.
438

(Pass 39)
If the virtual word has the letter ‘n’, and
if the letter ‘n’ is directly preceded by the letter 'o',
and if the letter ‘o’ is directly preceded by the letter ‘i’, and
if the letter ‘i’ is directly preceded by the letter ‘s’, then:
assign the letter ‘s’ the /sh/ phoneme #20;
assign the letter ‘i’ the /sh/ phoneme #20;
assign the letter ‘o’ the /ə/ phoneme #36;
assign the letter ‘n’ the /n/ phoneme #10; and
light the block stations for the letters ‘s’, ‘i’, ‘o’, and ‘n’.
439

440

FIG. 11j

(Pass 40)
If the virtual word has the letter 'c', and
if the letter 'c' is directly preceded by or directly followed by another letter 'c',
and if the two letter 'c's are directly followed by the letter 'e', or the letter 'i', then:
assign the first letter 'c' the /k/ phoneme #7;
assign the second letter 'c' the /s/ phoneme #13; and
light the block stations for the first letter 'c', the second letter 'c', and the letter 'e' or 'i'
440

(Pass 41)
If the virtual word has the letter 'o', and
if the letter 'o' is directly followed by the letter 'i', then:
assign the letter 'o' the /oi/ phoneme #41;
assign the letter 'i' the /oi/ phoneme #41; and
light the block station for the letter 'e' and the block station for the letter 'i'.
441

(Pass 42)
If the last letter of the virtual word is the letter 's', then:
assign the letter 's' the /z/ phoneme #18.
442

(Pass 43)
If the virtual word has the letter 'h', and
if the letter 'h' is directly preceded by the letter 'c',
and if the letter 'c' is directly preceded by the letter 't', then:
assign the letter 't' the silence phoneme #0; and
light the block stations for the letters 't', 'c', and 'h'.
443

(Pass 44)
If the virtual word has the letter 'r' or the letter 'k', and
if the letter 'h' immediately follows the letter 'r', or the letter 'k', then:
assign the letter 'h' the silence phoneme #0; and
light the block stations for the letter 'h', and the letter 'k' or 'r'.
444

445

FIG. 11k

(Pass 45)
If the virtual word has the letter 'm', and
if the letter 'm' is directly followed by the letter 'b', then:
assign the letter 'b' the silence phoneme #0; and
light the block stations for the letters 'm', and 'b'.
445

(Pass 46)
If the virtual word has the letter 'k' or the letter 'm', and
if the letter 'l' immediately precedes the letter 'k', or the letter 'm', then:
assign the letter 'l' the silence phoneme #0; and
light the block stations for the letter 'l', and the letter 'm' or 'k'.
446

(Pass 47)
If the virtual word has the letter 'b', and
if the letter 'b' is directly followed by the letter 't', then:
assign the letter 'b' the silence phoneme #0; and
light the block stations for the letter 'b', and the letter 't'.
447

(Pass 48)
If the virtual word has the letter 'm', and
if the letter 'm' is directly followed by the letter 'n', then:
assign the letter 'n' the silence phoneme #0; and
light the block stations for the letter 'm', and the letter 'n'.
448

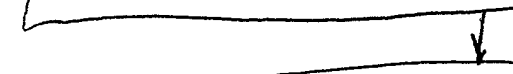
(Pass 49)
If the last letter in the virtual word is 'h', and
if the letter 'h' is directly preceded by a vowel, then;
assign the letter 'h' the silence phoneme #0; and
light the block stations for the letter 'h', and the vowel that precedes the letter 'h'.
449

450

FIG. 11l

(Pass 50)
If the first letter in the virtual word is 'w', and
if the letter directly following the letter 'w' is the letter 'h', and
if the letter directly following the letter 'h' is the letter 'o', then:
assign the letter 'w' the silence phoneme #0; and
light the block stations for the letters 'w', 'h', and 'o'.
450

(Pass 100)
If the virtual word has the letter 'd', and
if the letter 'd' is directly followed by the letter 'g; or the letter 'j', then:
assign the letter 'd' the silence phoneme #0; and
light the block stations for the letter 'd', and the letter 'g' or 'j'.
451



(Pass 101)
If the last letter in the virtual word is 'm', and
if the letter 'm' is directly preceded by the letter 's', then;
assign the letter 's' the /z/ phoneme #18; and
light the block stations for the letter 's' and the letter 'm'.
452

Fig. 11m

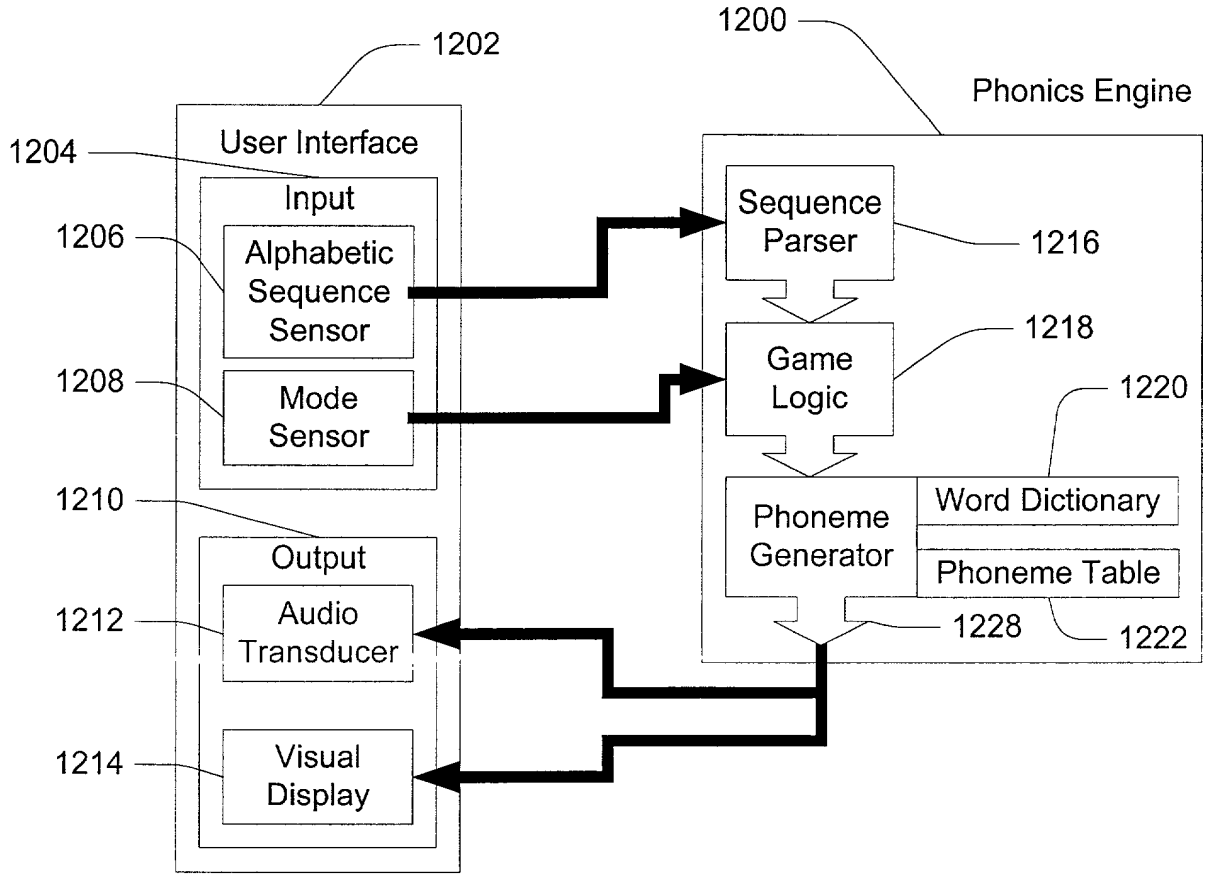

1200
Phonics Engine
1202
User Interface
1204
Input
1206
Alphabetic Sequence Sensor
1208
Mode Sensor
1210
Output
1212
Audio Transducer
1214
Visual Display
Sequence Parser
1216
Game Logic
1218
1220
Word Dictionary
Phoneme Generator
Phoneme Table
1228
1222

FIG. 12

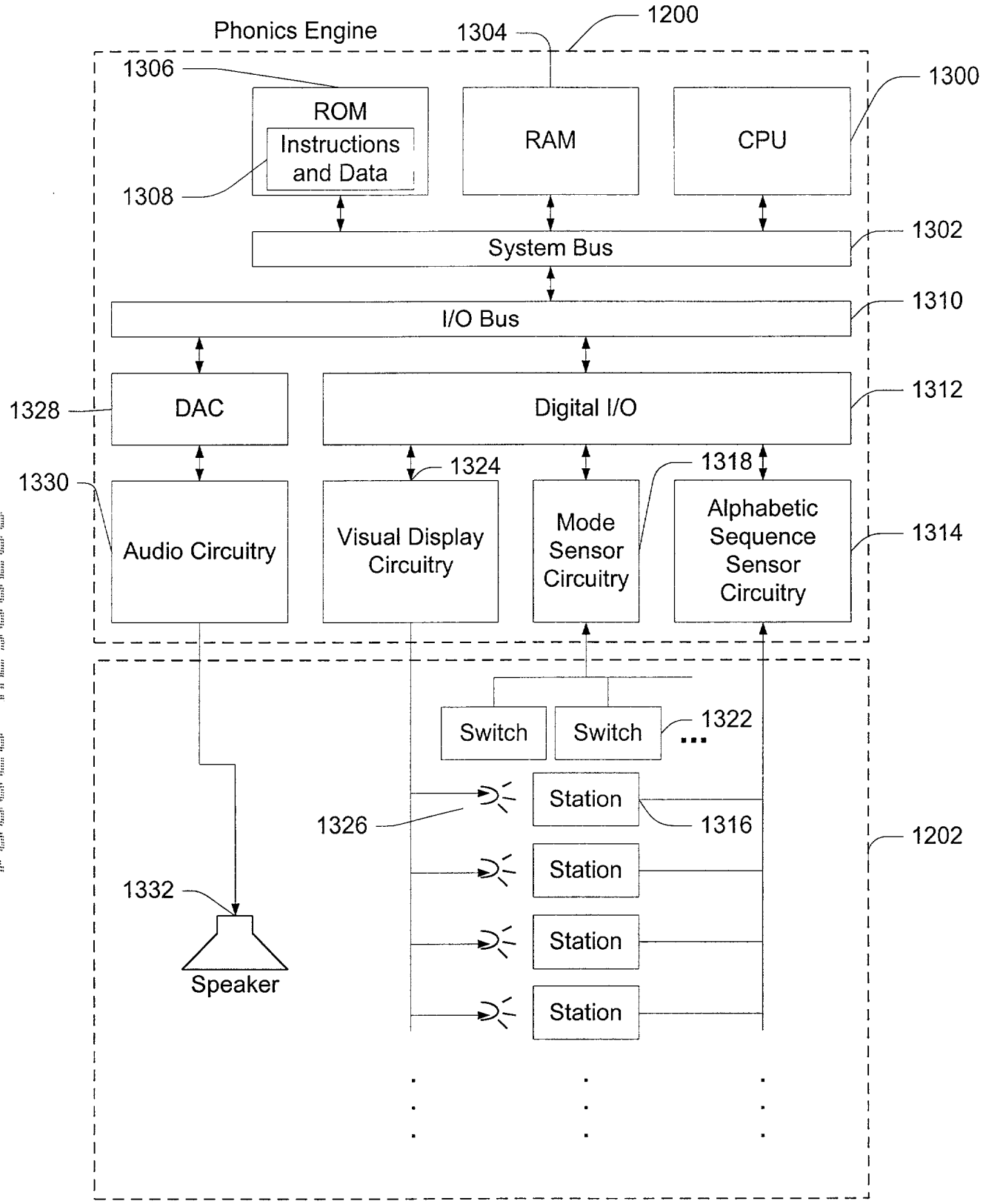

Phonics Engine
1304
1200
1306
ROM
Instructions and Data
1308
RAM
CPU
1300
System Bus
1302
I/O Bus
1310
1328
DAC
Digital I/O
1312
1330
1324
1318
Audio Circuitry
Visual Display Circuitry
Mode Sensor Circuitry
Alphabetic Sequence Sensor Circuitry
1314
Switch
Switch
1322
Station
1326
1316
1202
1332
Station
Station
Station
Speaker
User Interface

FIG. 13

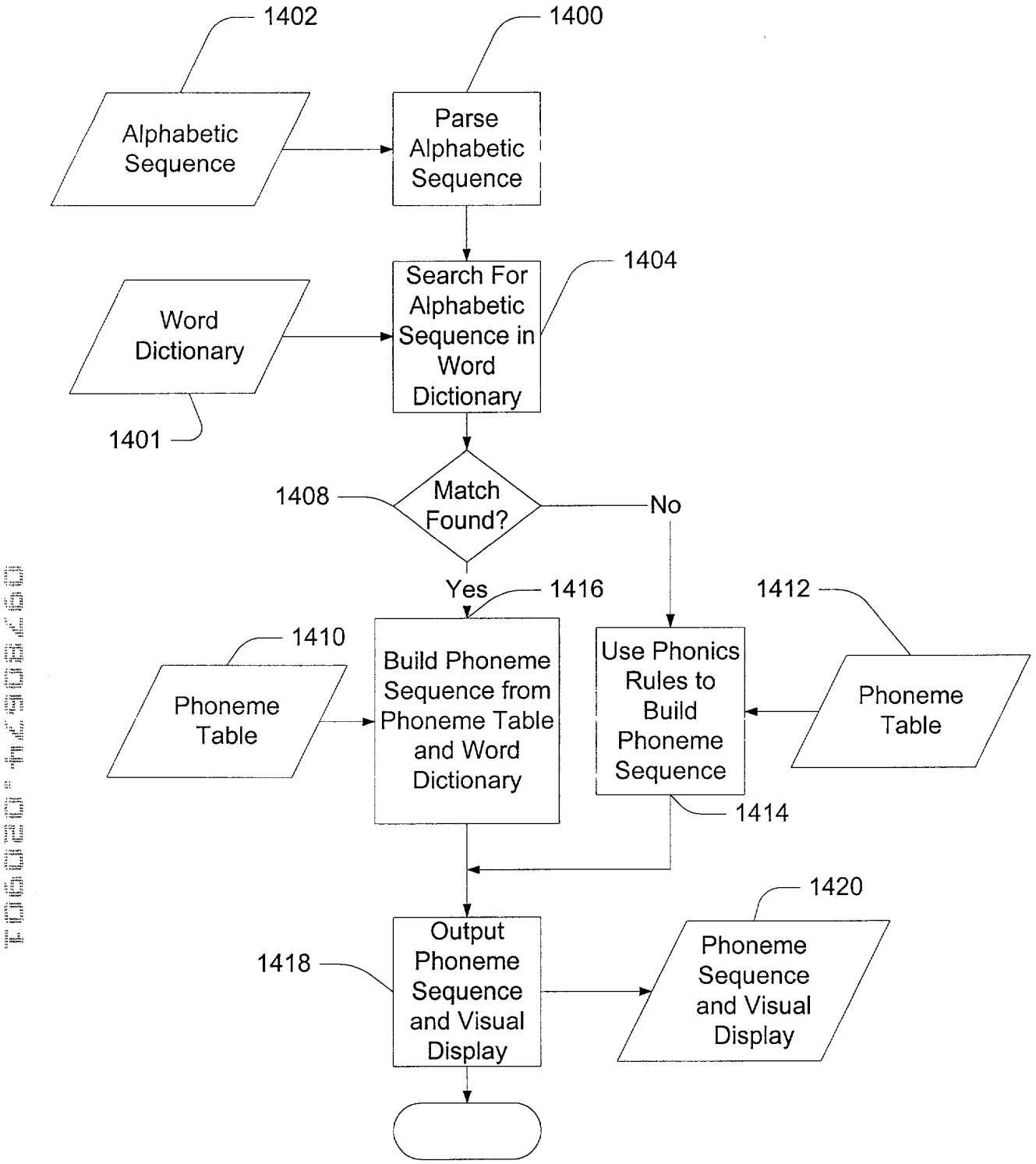

1402
1400
Alphabetic Sequence
Parse Alphabetic Sequence
Search For Alphabetic Sequence in Word Dictionary
1404
Word Dictionary
1401
1408
Match Found?
No
Yes
1416
1412
1410
Phoneme Table
Build Phoneme Sequence from Phoneme Table and Word Dictionary
Use Phonics Rules to Build Phoneme Sequence
Phoneme Table
1414
1420
1418
Output Phoneme Sequence and Visual Display
Phoneme Sequence and Visual Display

FIG. 14

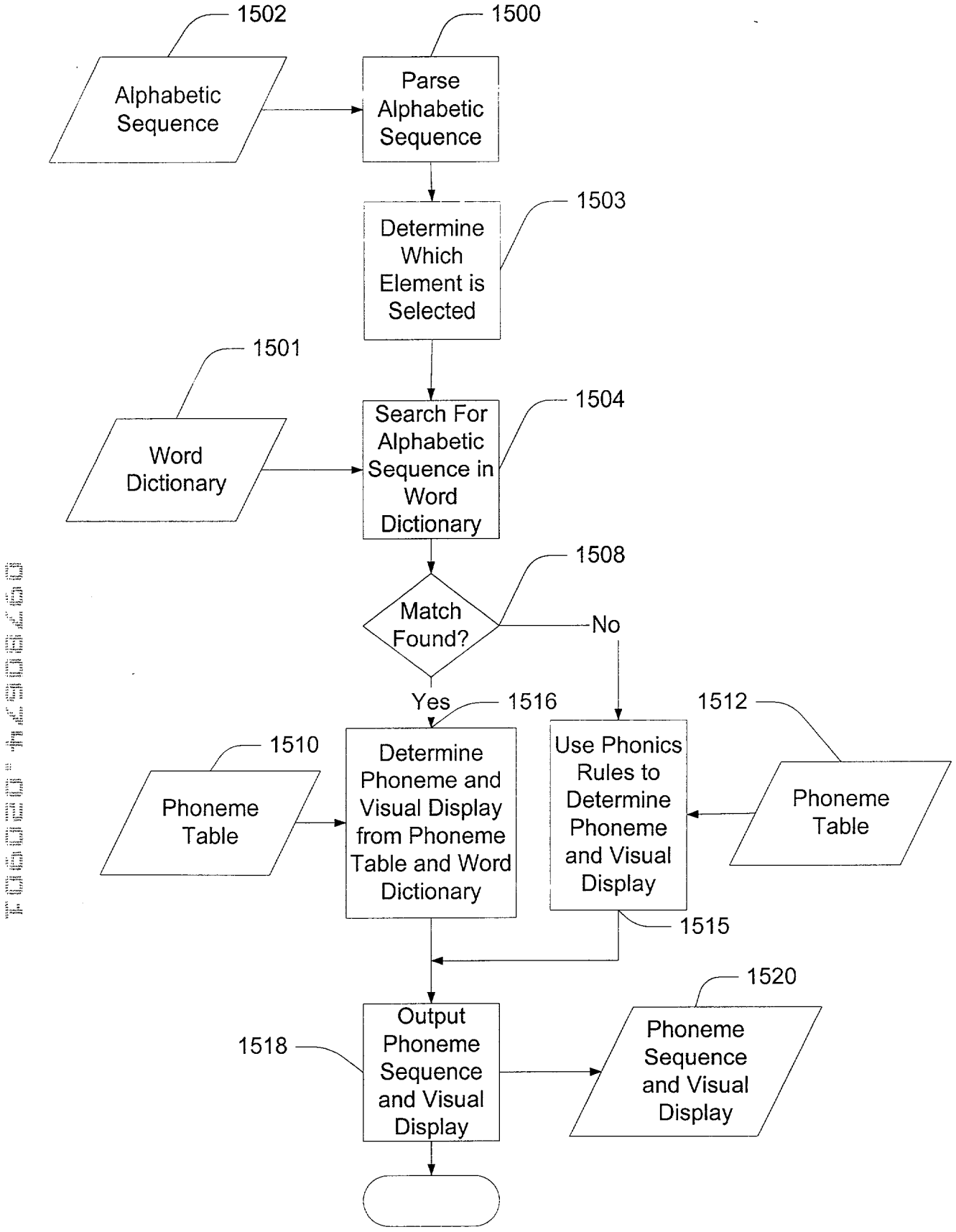

1502
1500
Alphabetic Sequence
Parse Alphabetic Sequence
1503
Determine Which Element is Selected
1501
1504
Word Dictionary
Search For Alphabetic Sequence in Word Dictionary
1508
Match Found?
No
Yes
1516
1512
1510
Phoneme Table
Determine Phoneme and Visual Display from Phoneme Table and Word Dictionary
Use Phonics Rules to Determine Phoneme and Visual Display
Phoneme Table
1515
1520
1518
Output Phoneme Sequence and Visual Display
Phoneme Sequence and Visual Display

FIG. 15